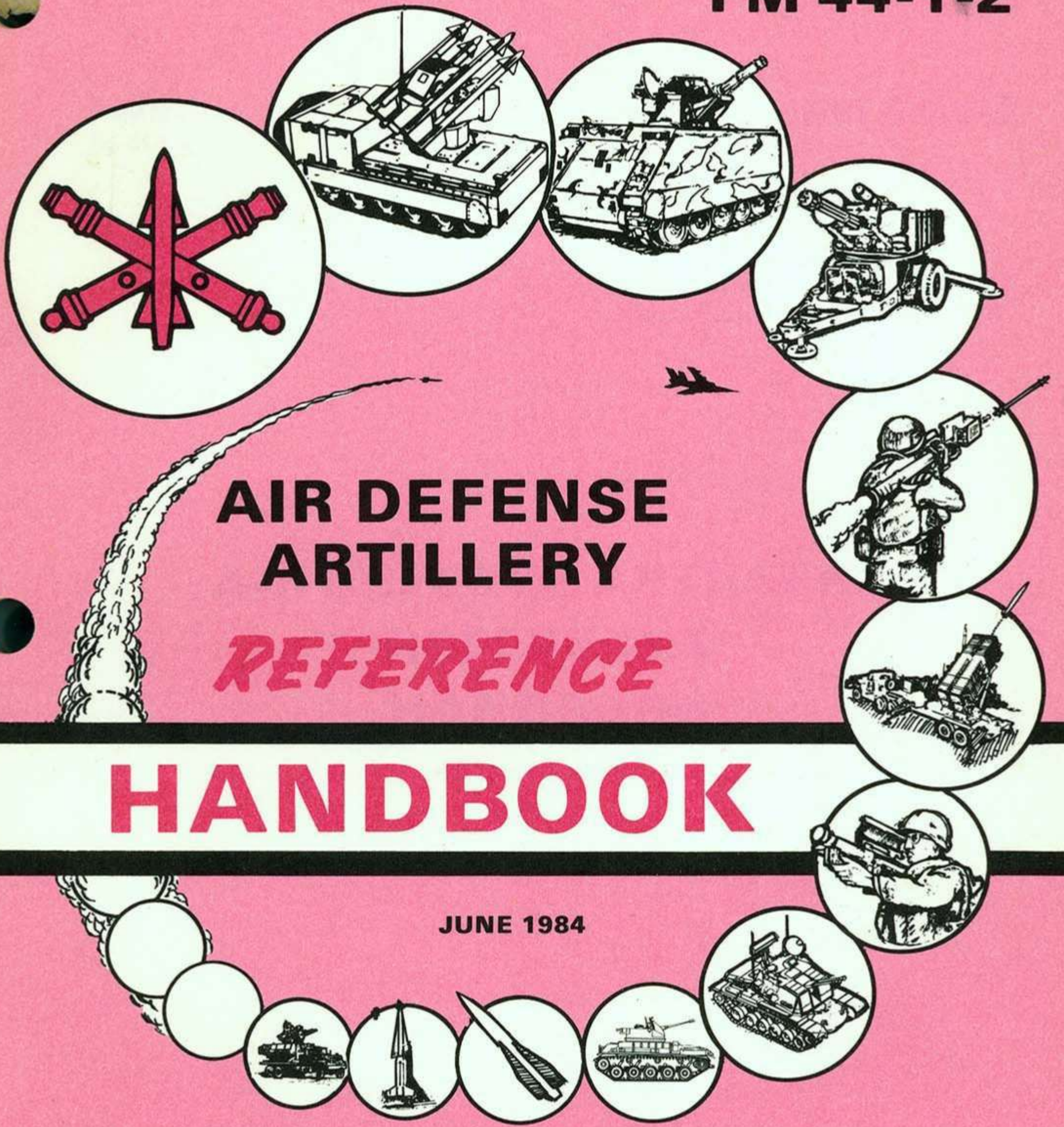
FM 44-1-2



AIR DEFENSE ARTILLERY

REFERENCE

HANDBOOK

JUNE 1984

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HEADQUARTERS, DEPARTMENT OF THE ARMY

Field Manual
No. 44-1-2

***FM 44-1-2**

HEADQUARTERS
DEPARTMENT OF THE ARMY
Washington, DC, 15 June 1984

AIR DEFENSE ARTILLERY REFERENCE HANDBOOK

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*This FM supersedes FM 44-1-2, 30 June 1978.

Preface

It is probable that the first attacks of the next war will be from the air and that the first targets of these attacks will include air defense artillery (ADA) units. ADA units will be engaged in the initial attacks as they defend maneuver forces, vital airfields, logistic elements, and other critical assets in priority as determined by the force commander.

The purpose of this field manual is to provide a ready source of selected ADA information in a convenient format for officers and noncommissioned officers assigned functions and duties concerned with the employment of ADA units and weapons. Much of the information is provided in brief form. For more precise and detailed information, refer to the ADA references listed in References section.

ADA data on a wide variety of subjects pertinent to the functions and duties of personnel serving in the Army ADA specialty are provided in this field manual. This FM will aid the commissioned and noncommissioned officers serving in the following types of duty positions:

- Commanding, directing, and controlling ADA units.
- Staff positions in headquarters and activities requiring ADA expertise.
- Airspace management elements of divisions and higher level.
- Instructor positions in ADA specialty in service schools and ROTC.
- Members of advisory elements and groups assigned to missions in foreign countries.
- Advisory positions in Reserve Force components.
- Combat and leadership positions in Special Forces units.
- Executive and advisory positions requiring knowledge of a variety of air defense subjects.

Readers are reminded that materiel, organization, and tactics are continually changing. For precise planning, other publications such as technical manuals, tables of organization and equipment, and field manuals which provide more detailed information on specific subjects should be consulted. Many of these sources are referred to in appropriate sections of this field manual as well as in Reference section.

Users of this manual are encouraged to submit recommended changes or comments to improve the publication. Comments should be keyed to the specific page and line of text in which the change is recommended. Reasons should be provided for each comment to insure understanding and complete evaluation. Comments should be prepared on DA Form 2028 (Recommended Changes to Publications and Blank Forms) and forwarded directly to:

Commandant
US Army Air Defense Artillery School
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Fort Bliss, Texas 79916

AIR DEFENSE ARTILLERY REFERENCE HANDBOOK

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When used in this publication, "he" "him," "his," and "men" represent both the masculine and feminine genders unless otherwise stated.

CHAPTER 1

SHORAD Systems

Short-range air defense (SHORAD) weapons are normally employed in support of maneuver forces. They defend the most critical assets against attack by enemy close support aircraft and helicopters. They are also employed in rear areas to defend such assets as air bases, and other forces and key installations in the corps area. SHORAD weapons include gun and missile systems. Examples are, the Duster, Vulcan, SGT York Gun systems, Chaparral and Roland missile systems, and man-portable air defense (MANPAD) systems such as Redeye and Stinger.

GUNS

SHORAD gun systems include Duster, Vulcan, and the SGT York Gun. The SGT York Gun is the newest gun in the AD inventory. The M42A1 Dusters are issued to US Army National Guard Air Defense Artillery (ADA) units. There are no Duster gun systems in the Active army.

DUSTER

The gun antiaircraft artillery, self-propelled (SP), twin 40-mm, M42A1, Duster, provides defense against very-low-to-low-altitude air attack.

System Description

The M42 or M42A1 is a full-track-laying, armored, antiaircraft vehicle which can operate in temperatures ranging from -65° to +120°F. Major armament is a 40-mm dual automatic gun M2A1 mounted in the 40-mm twin-gun mount M4E1. This vehicle was designed for use with the maneuver forces against low-altitude air attack. Because of the rapid rates of fire, the gun has proved to be effective as a support weapon against ground targets. The interior of the vehicle is divided into three areas: driving compartment at the front, stowage compartment in the center, and engine compartment in the rear. The driving compartment contains the driving controls and instruments. The seats for driver and commander-radio operator are in the driving compartment. The stowage compartment serves as a base for the gun mount and has stowage space for 12 boxes of 40-mm ammunition. The engine compartment houses the main engine, auxiliary generator and engine, transmission, and fuel tanks. The gunner, squad leader, and connoneer

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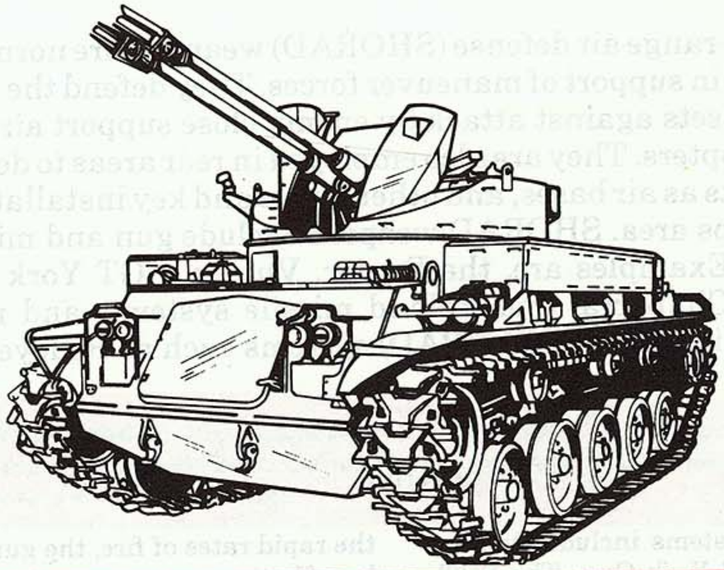
ride in the gun mount. The squad leader commands, via the intercommunications set AN/VIC-1, either from the commander's seat or the gun mount (see illustration below).

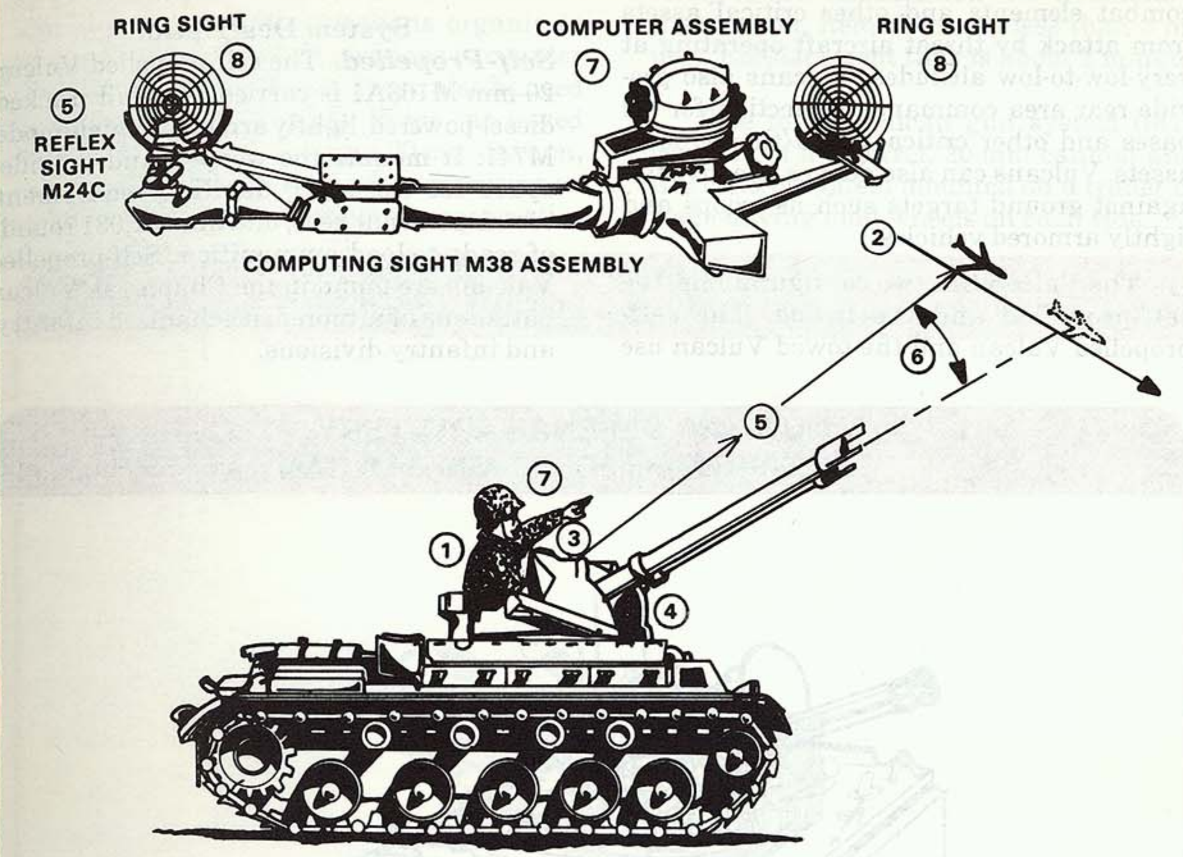
DUSTER M42A1



DUSTER SYSTEM CHARACTERISTICS

General Characteristics	Weight, combat loaded		49,500 lbs
	Width, overall	3.23 meters	(127 in)
	Length, overall	6.38 meters	(251 in)
	Height, travel mode	2.87 meters	(113 in)
	Allowable speed	72 kmph	(45 mph)
	Cruising range (avg)	161 km	(100 miles)
Weapon Characteristics	Range, aerial/ground	1550-1850 meters	
	Traverse limits		360°
	Elevation limits		–5° to +87° manual mode –3° to +85° power mode
Miscellaneous Data	Crew		5 personnel
	Fire control		computing sight M38
	No. of barrels		2
	Barrel life		12,000 rds
	Ammunition		HEI-T SD HE-T SD AP-T

DUSTER ENGAGEMENT SEQUENCE



System Operation

The squad leader **1** designates the target, estimates target speed, direction of flight and the angle of dive or climb **2** , and sets these values into the computing sight M38 **8** . The gunner **3** engages the power drive mechanism and traverses the gun mount and elevates the dual 40-mm guns **4** until the target is centered in the reticle of the reflex sight M24C **5** . The sight mechanically computes the lead angle **6** based on target speed and flight direction; superelevation is automatically inserted based on gun elevation. When target tracking is steady, the gunner reports, ON. Upon receiving the report, ON, and having determined that the target is within range, the squad leader commands, FIRE. The gunner commences firing and continues to fire until the target is destroyed or the squad leader commands, CEASE FIRING. The normal mode of firing is the power control mode, using the M38 computing sight. An alternate mode of operation is the manual mode. In this mode, the mount and dual gun are moved in azimuth and elevation by hand-operating cranks. When operated in the manual mode, speed ring sights **8** are used for fire control.

VULCAN

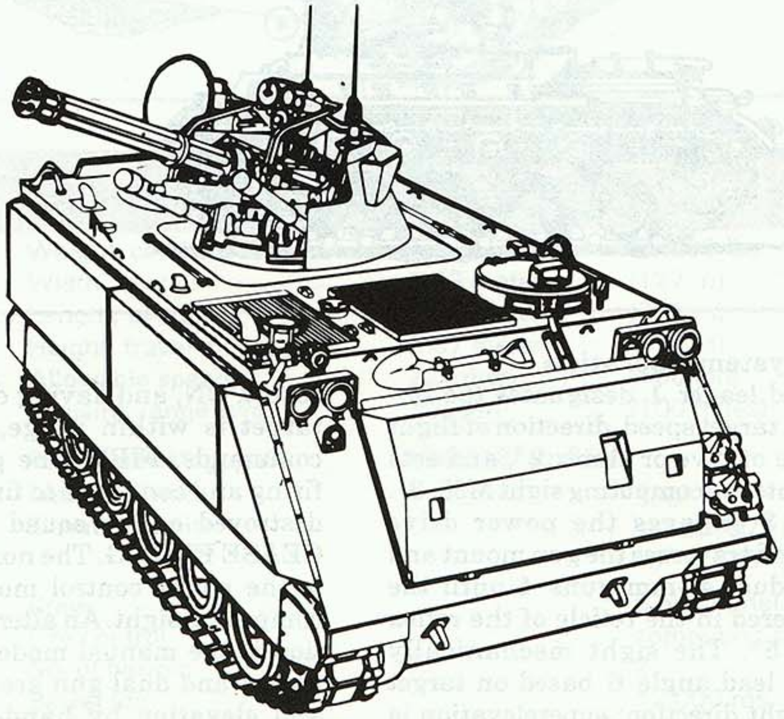
The Vulcan gun system is a short-range air defense gun. It protects forward area combat elements and other critical assets from attack by threat aircraft operating at very-low-to-low altitudes. Vulcans also provide rear area commands protection for air bases and other critical corps/theater-level assets. Vulcans can also deliver effective fire against ground targets such as troops and lightly armored vehicles.

The Vulcan has two configurations, the self-propelled and the towed. The self-propelled Vulcan and the towed Vulcan use the same weapon system but they have different carriers.

System Description

Self-Propelled. The self-propelled Vulcan 20-mm M163A1 is carried on a full tracked, diesel-powered, lightly armored vehicle model M741. It mounts the weapon and provides space for the crew, auxiliary equipment, crew's personal gear, and about 1,031 rounds of ready-to-load ammunition. Self-propelled Vulcans are found in the Chaparral/Vulcan battalions of armored, mechanized infantry, and infantry divisions.

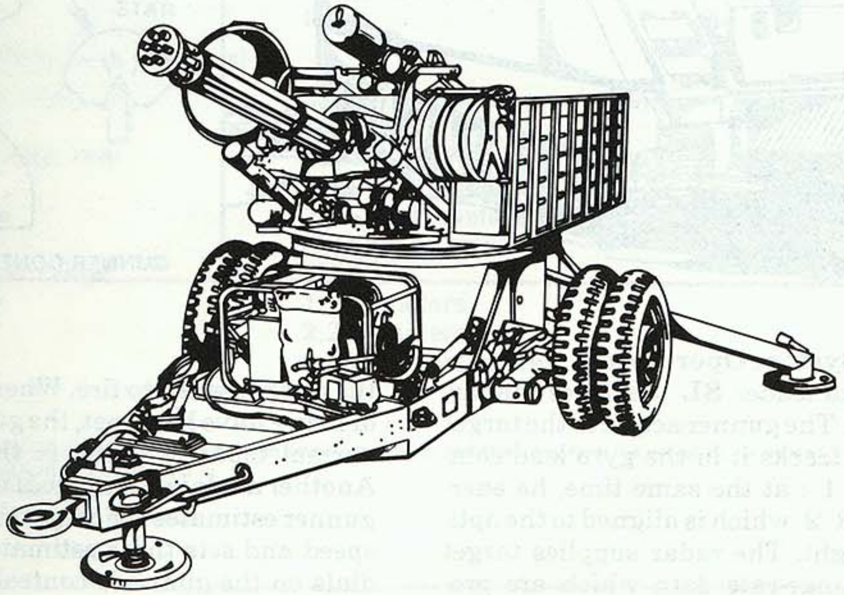
GUN, AIR DEFENSE ARTILLERY,
SELF-PROPELLED, 20-MM, VULCAN



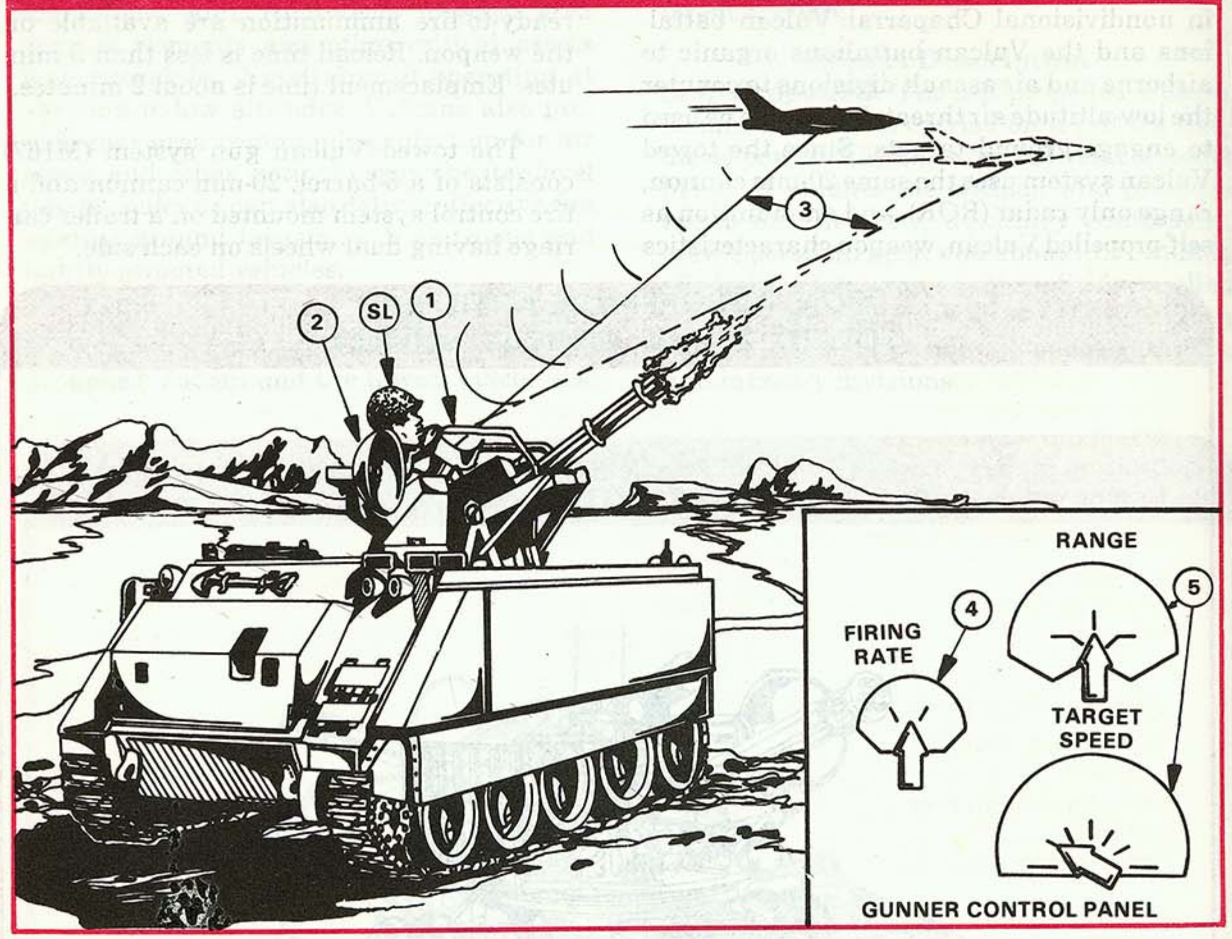
Towed. The towed version of Vulcan is used in nondivisional Chaparral/Vulcan battalions and the Vulcan battalions organic to airborne and air assault divisions to counter the low-altitude air threat. It can also be used to engage ground targets. Since the towed Vulcan system uses the same 20-mm cannon, range only radar (ROR), and ammunition as self-propelled Vulcan, weapon characteristics are similar except that only 500 rounds of ready-to-fire ammunition are available on the weapon. Reload time is less than 3 minutes. Emplacement time is about 2 minutes.

The towed Vulcan gun system (M167) consists of a 6-barrel, 20-mm cannon and a fire control system mounted on a trailer carriage having dual wheels on each side.

GUN, AIR DEFENSE ARTILLERY,
TOWED, 20-MM, M167A1, VULCAN



VULCAN ENGAGEMENT SEQUENCE



System Operation

The squad leader **SL** identifies the target as hostile. The gunner acquires the target visually and tracks it in the gyro lead computing sight **1** ; at the same time, he energizes the ROR **2** which is aligned to the optical line of sight. The radar supplies target range and range-rate data which are processed to provide the proper superelevation and lead angles **3** . The gunner selects the firing rate of 1,000 rpm with no burst limit, or 3,000 rpm with a burst limit of 10, 30, 60, or 100 rounds appropriate to the type of target **4** . A ready-to-fire lamp lights, alerting the gunner when to fire. When all conditions of firing have been met, the gunner fires. The normal mode of firing is the radar mode. Another mode is the manual mode, where the gunner estimates the target range and target speed and sets these estimates on indicator dials on the gunner's control panel **5** . The lead computing sight then computes the superelevation and lead angles based on these estimates. Functions, and engagement and firing procedures are alike for both the self-propelled and towed systems.

VULCAN CHARACTERISTICS, SELF-PROPELLED AND TOWED

	Gun, AA, 20-mm; M163A1, self propelled	Gun, AA, 20-mm, M167A1, towed
WEIGHT AND DIMENSIONS		
Weight	27,542 pounds (12,493kg)	3,490 pounds (1429kg)
Length	172 inches (436.9cm)	186 inches (472.4cm)
Width	113 inches (287.0cm)	79 inches (200.7cm)
Height	115 inches (292.1cm)	81 inches (205.7cm)
MOBILITY		
Max speed-on road	40 mph (64.4 kmph)	45 mph (72.4 kmph)
Max speed-fording	4 mph (6.4 kmph)	2-3 mph (3.2-4.8 kmph)
Max speed-swimming	4 mph (6.4 kmph)	Cannot
Maximum water depth	*	**
Cruising range	275 miles (442.6 km)	300 miles (483 km)
Turning radius	12.8 feet (3.9 meters)	29 feet (8.8 meters)
AMMUNITION, 20-mm		
In weapon	1,100	500
Ready to load	1,000	
In boxes	Remainder of basic load	Remainder of basic load
CAPABILITIES (both versions)		
Rate of fire, high rate	3,000 rds (shots per minute)	
Low rate	1,000 spm	
Burst limit, high rate	10, 30, 60, 100 rd	
Low rate	Gunner controlled	
Radar range	250-5,000 meters (1 sq meter target)	
Max effective range		
Air defense	1,200 meters	
Ground	2,200 meters direct 4,500 meters indirect	

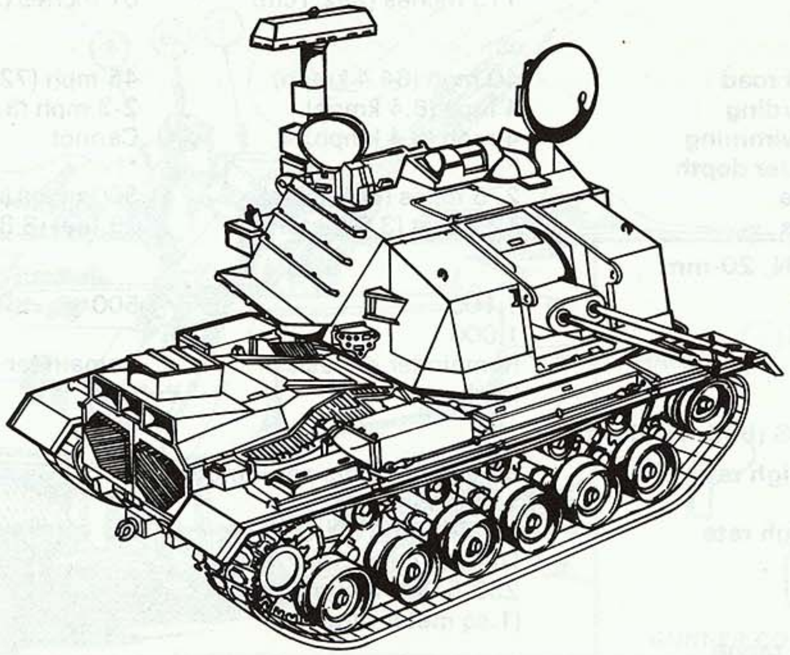
*The M163A1 is limited in its swim capability to small inland lakes and streams where the waves do not exceed 11" in height.
**The fording capability of the M167A1 is:
Fording depth w/o APU—39 in.
Fording depth w/APU—17 in.

SGT YORK GUN

The SGT York Gun is a quick-reacting, all-weather, radar-directed gun system. It uses twin 40-mm cannons in an armored turret and is mounted on an M48A5 tank chassis. The SGT York Gun provides air defense for the forward combat forces in the

Army's heavy divisions, nondivisional brigades, and SHORAD units. The system uses the latest computer, laser, armament, and radar technologies. These and other advances in weapon system development have provided the Army an air defense system with unique capabilities. The SGT York Gun will eventually replace the self-propelled Vulcan gun system. The SGT York Gun is air transportable in C5A aircraft.

SGT YORK GUN M247



System Description

The SGT York Gun consists of twin L/70 40-mm automatic guns with a rate of fire of 300 rounds per minute per gun. The guns are interoperable with other L/70 guns. The SGT York Guns have a linkless feed system with upper and lower magazines for each gun with a capacity of 502 rounds. Three types of ammunition are available for the SGT York Gun: training target practice tracer (TPT), proximity fuze, and point detonating. The proximity fuze round has a delayed action high-explosive charge. This is the primary round for aerial targets and is interoperable with North Atlantic Treaty Organization (NATO) L/70 guns. The point-detonating round is primarily for ground targets and is used in a self-defense role only.

The search/track radar for the SGT York Gun is a fully automatic, F-16 aircraft derived, pulse doppler with three beams providing full elevation coverage. The radar contains an integrated identification, friend or foe (IFF), system and ECCM provisions.

The SGT York Gun provides these additional features—

- ■ Automatic threat prioritization.
- ■ Automatic selection of ammunition type and burst schedule.
- ■ Automatic lead angle computation and meteorologic inputs.

The fire control system has a manual override for all computer functions and provides a self-defense direct/indirect fire capability against ground targets. The combat display within the SGT York Gun is comprehensive. Targets (friend or foe) are displayed with a prioritization symbology for threat targets. Primary target line, search sector limits, and range rings are displayed. The hull heading, gun orientation, gunsight line of sight, periscope line of sight, ammunition status, acquisition mode, and system status are displayed. The SGT York Gun integrated laser range finder gunsight has a stabilized day/night sight with a 5° day/3° night field of view. There is a squad leader's periscope, independent of the gunsight, which has a 360° under armor, stabilized day/night search, and a 20° day/12° night field of view. The crew compartment in the SGT York Gun turret is environmentally controlled.

System Operation

As the acquisition radar detects and interrogates targets, the fire control computer classifies and prioritizes them. The turret then slews to the target, chosen either automatically by the system on crew consent or manually by the gunner/squad leader. The tracking radar automatically locks on the chosen target and aligns the tracking optics. The fire control system then aims the guns and selects the optimum ammunition type and burst length. When the target is within engagement range, the fire control system signals the gunner/squad leader. The gunner/squad leader pulls the trigger allowing the guns to fire. At the same time, the system continues to search and update target data. After the gunner/squad leader terminates the engagement, the system is ready to slew to the next priority target. The SGT York Gun is capable of performing these functions while moving cross-country, thus providing air defense for maneuvering forces, and a capability against lightly armored threat vehicles.

SGT YORK GUN

General Characteristics	Crew	3 personnel	
	Weight, combat loaded	(62 tons)	56,245 kg
	Width, overall	(141 in)	3.58 meters
	Length, overall (guns forward)	(295 in)	7.49 meters
	Height (antennas stowed)	(134 in)	3.4 meters
	Speed (max)	(30 mph)	48 kmph
	Cruising range	(approx 310 mi)	499 km
Weapon Characteristics	Max rate of fire	300 rds per min per gun	
	Rounds on carriage (40-mm)	502	
	Traverse limits	360°	
	Elevation limits	-10° to +85°	
Miscellaneous Data	Fire control	acquisition and tracking radar, laser range finder, computer controlled	

MISSILES

SHORAD missiles consist of the short-range, man-portable, air defense missiles. These missiles include the Redeye and Stinger and very-low-to-low-altitude Chaparral and Roland missile systems. Redeye and Stinger are designed to counter high-speed, low-level, ground attack aircraft. They are also effective against helicopter, observation, and transport aircraft. The Chaparral system is designed to counter high-speed, low-altitude air threat to organizations and critical assets in the forward areas. The Roland provides all-weather, short-range, low-altitude air defense. Roland is designed to complement medium-to-high-altitude air defense systems as well as low-altitude gun and missile systems. This is done by providing an integrated air defense throughout an area of operations. Roland is not in the US Army inventory; however, it is assigned to National Guard units.

REDEYE

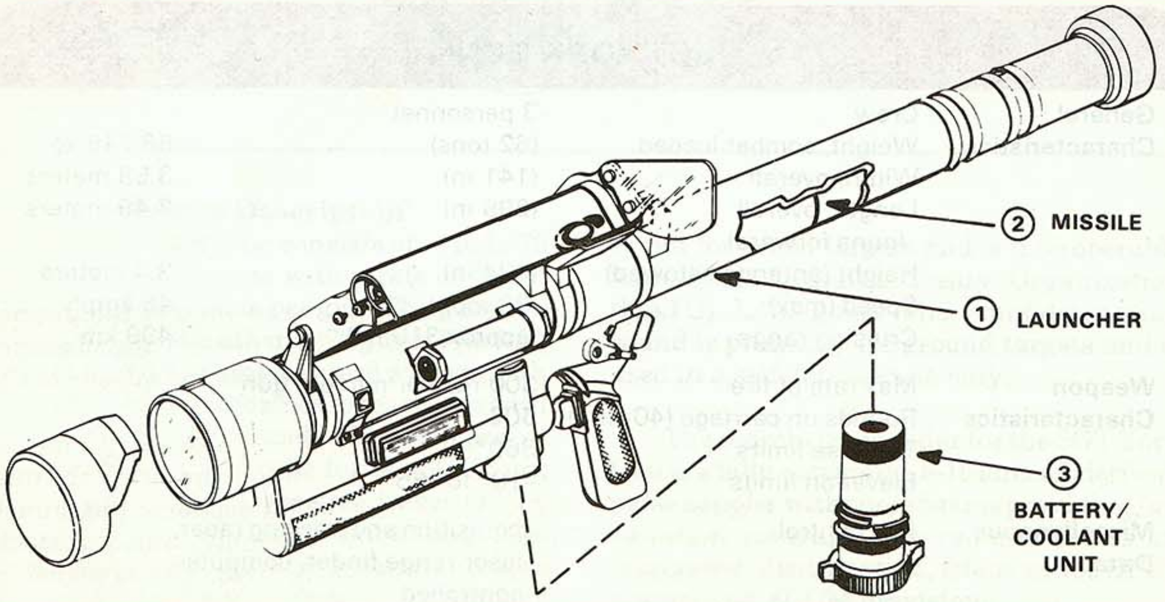
Redeye was the first man-portable air defense weapon system in the Active Army inventory. Redeye will be eventually replaced by the Stinger missile system.

System Description

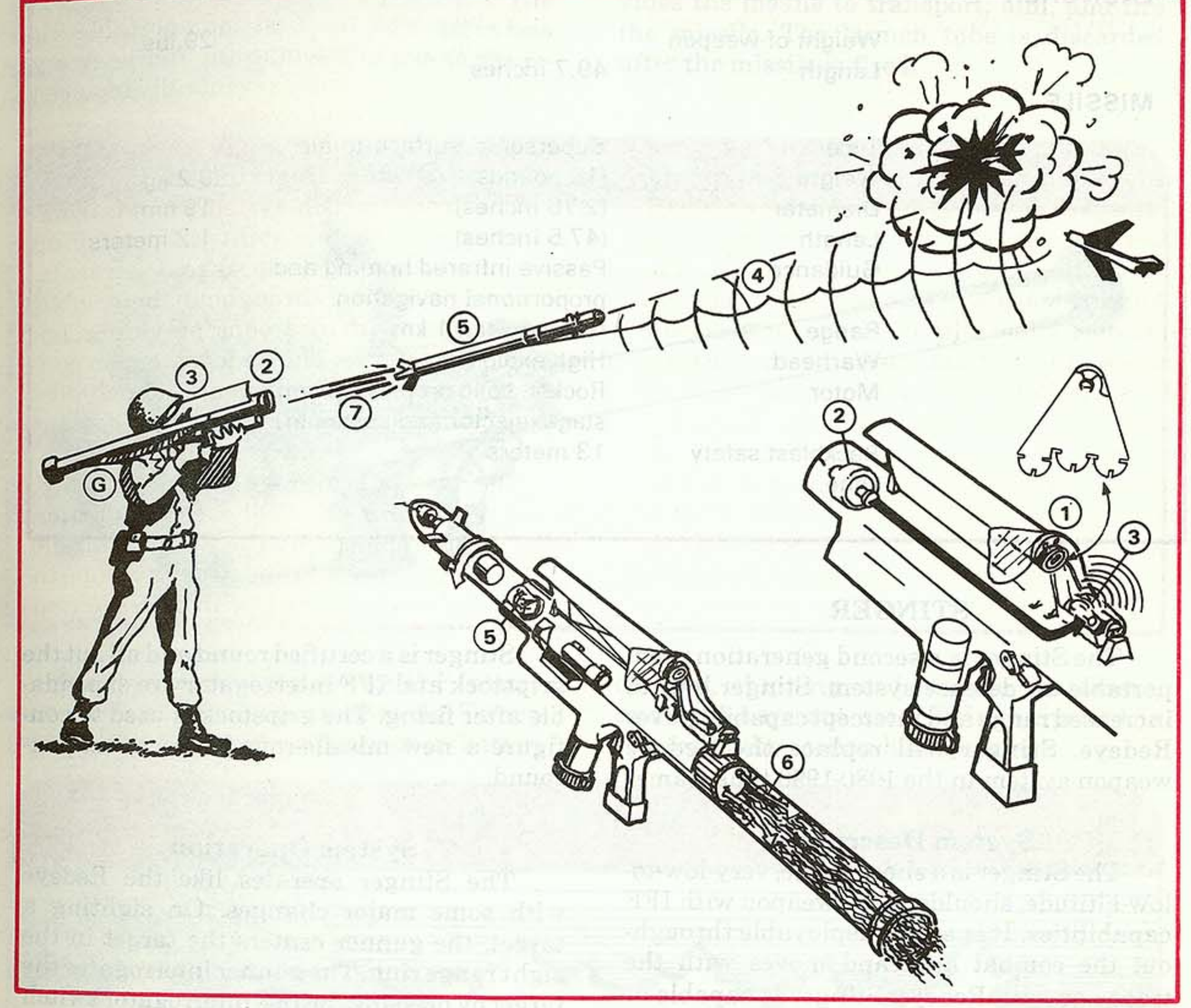
The Redeye missile system provides combat units with the capability of destroying very-low-to-low-altitude threat aircraft. Redeye is deployed throughout the combat area. It moves with the troops, providing continuous air defense. The Redeye weapon consists of three major components: launch tube assembly, missile-round, and battery/coolant unit.

The missile, sealed within the launcher, is not removed in the field except by firing. After being replaced by the Stinger missile system, it is expected that Redeye will be in service for several years with Reserve and National Guard units.

REDEYE WEAPON M41



REDEYE ENGAGEMENT SEQUENCE



System Operation

On sighting a threat target, the gunner G tracks it visually in an open sight **1** . At the same time, the gunner activates the missile guidance system **2** . A buzzer **3** informs the gunner when the target is acquired and the missile is ready to fire. The gunner inserts superelevation and lead **4** to the missile target line of sight and fires the missile **5** out of the launch tube **6** . When the missile has cleared the launch tube muzzle by a distance sufficient to protect the gunner from blast effect (5 to 9 meters), the sustainer motor fires **7** and propels the missile to the target.

The Redeye launcher provides the means for transporting, aiming, and firing the missile. It has three main sections: the launch tube, open sight assembly, and gripstock. After the missile is fired, the launcher is discarded.

REDEYE SYSTEM CHARACTERISTICS

LAUNCHER	Weight of weapon		29 lbs.
	Length	49.7 inches	
MISSILE	Type	Supersonic, surface-to-air	
	Weight	(18 pounds)	8.2 kg
	Diameter	(2.75 inches)	19 cm
	Length	(47.5 inches)	1.2 meters
	Guidance	Passive infrared homing and proportional navigation	
	Range	Greater than 1 km	
	Warhead	High explosive	
	Motor	Rocket, solid propellant, two-stage (ejector and sustainer)	
	Backblast safety zone.	13 meters	

STINGER

The Stinger is a second generation man-portable air defense system. Stinger has an increased range and intercept capability over Redeye. Stinger will replace the Redeye weapon system in the 1980-1990 time frame.

System Description

The Stinger is a short-range, very-low-to-low-altitude, shoulder-fired weapon with IFF capabilities. It is easily deployable throughout the combat area and moves with the troops as with Redeye. Stinger is capable of engaging all aircraft operating at low level and at ordnance delivery speeds.

The Stinger missile system consists of the following major components:

- Launch tube assembly.
- Missile-round.
- Battery/coolant unit.
- Separable gripstock.
- IFF interrogator.

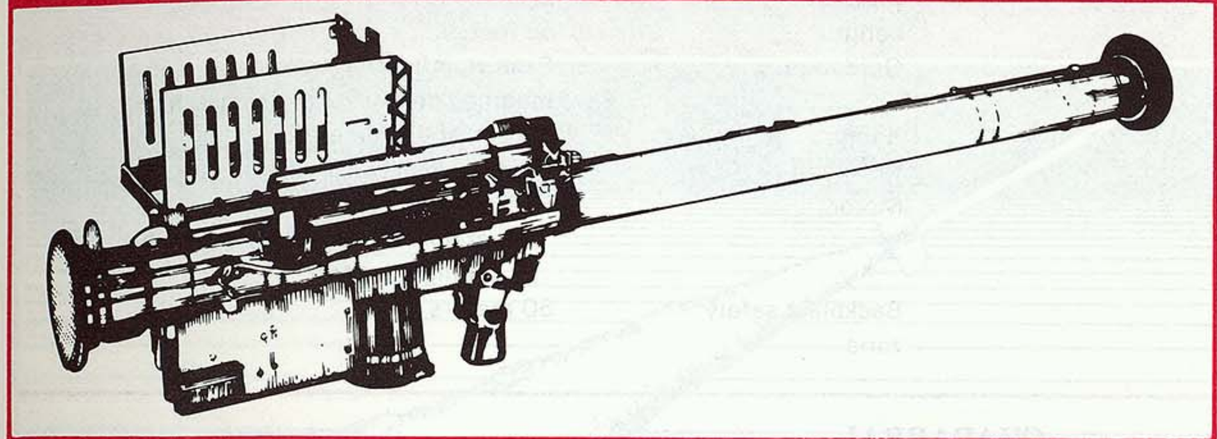
Stinger is a certified round and all but the gripstock and IFF interrogator are expendable after firing. The gripstock is used to configure a new missile-round into a weapon-round.

System Operation

The Stinger operates like the Redeye with some major changes. On sighting a target, the gunner centers the target in the sight range ring. The gunner interrogates the target by pressing the IFF interrogator switch and listens for an IFF response. If the response is not a positive friend, he continues tracking and ranging the target. When the target is within range, he operates a safety and actuation device. When a distinct acquisition tone is heard, he presses and holds the uncaging switch. After identifying the target as hostile (aided and assisted by the team chief), the gunner will superelevate the weapon. He will then place the target in proper lead reticle and, if infrared radiation (IR) tone is still distinct, he squeezes and holds the firing trigger and continues to track the target until the missile is launched. The battery coolant unit must be removed in less than 3 minutes to prevent damage to the reusable gripstock.

The launcher includes the launch tube assembly and a separable gripstock. It provides the means to transport, aim, and fire the missile. The launch tube is discarded after the missile is fired.

STINGER MISSILE SYSTEM



IFF components include the IFF interrogator and an interconnecting cable. To support the IFF subsystem, a programer/battery charger, shipping and storage containers, and code keys are used. This equipment is located at the section headquarters.

STINGER TEAM

STINGER SYSTEM CHARACTERISTICS

LAUNCHER		
	Weight of weapon	34.9 lbs.
	Length	60 inches
MISSILE		
	Type	Supersonic, surface-to-air
	Diameter	2.75 inches
	Length	58 inches
	Guidance	Passive infrared homing and modified proportional navigation
	Range	Excess of 4 kilometers
	Warhead	High explosive
	Motor	Rocket, solid propellant, two-stage (separable launch motor and dual-thrust flight motor)
	Backblast safety zone	50 meters

CHAPARRAL

The Chaparral guided missile system, intercept aerial, carrier-mounted (M48A1), consists of a launching station (M54A1) mounted on a full-tracked carrier (M730). It is equipped with IFF equipment. The system fires Chaparral guided missiles MIM-72A and MIM-72C/E.

System Description

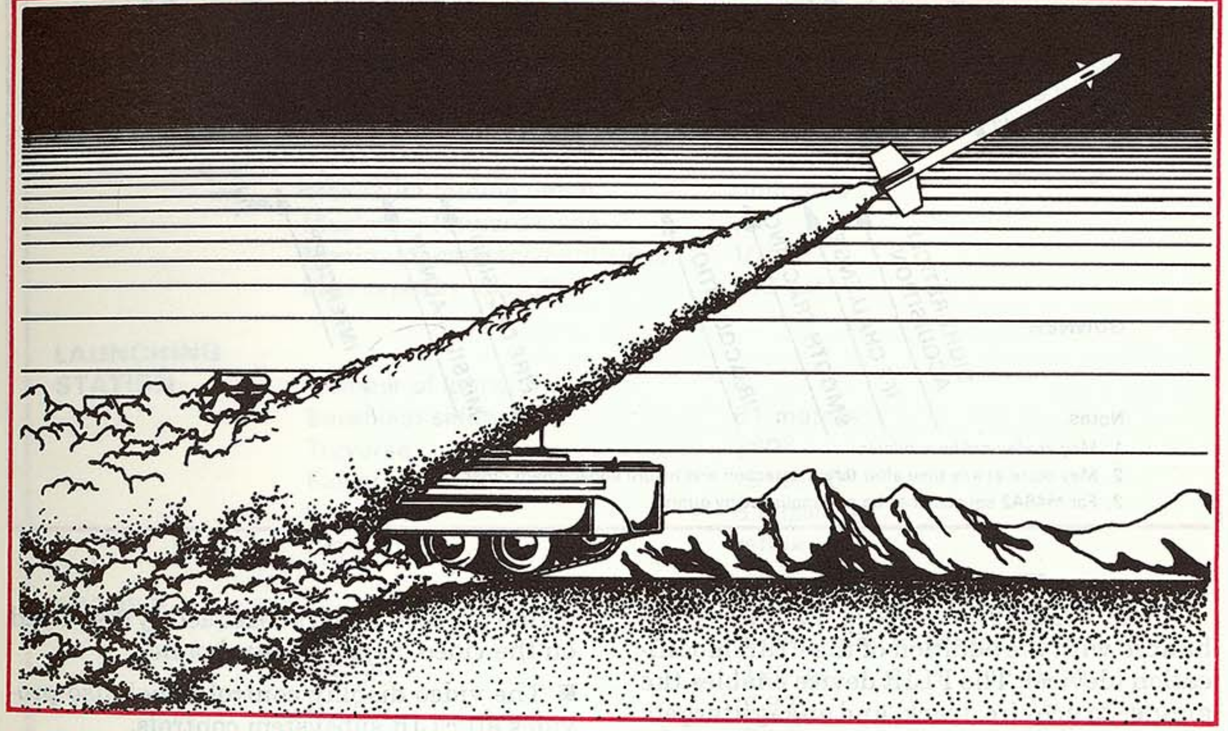
The Chaparral is a highly mobile, surface-to-air missile system fielded to protect stationary critical assets within the division against low-flying enemy aircraft. Chaparral is fielded in the self-propelled configuration only (with the exception of the 9th Infantry Division, High Tech, Light Division [9ID HTLD] program); however, the launching station is a complete, self-contained weapon system and may be separated from the carrier and operated in a ground-emplaced mode. Effective employment of the system depends upon visual target detection, tracking, and recognition. Chaparral is considered to be a fair-weather system capable of operation only during periods of good visibility. The system is air portable by cargo aircraft. The launching station may be sling lifted by helicopter when separated from the carrier. The system is composed of three major elements: the launching station, carrier, and Chaparral missiles. The Chaparral missile system is found in the Chaparral/Vulcan battalion of armored, mechanized infantry, and infantry divisions and in nondivisional Chaparral/Vulcan battalions. The Chaparral is manned by short-range air defense crewmen in MOS 16P.

System Operation

The Chaparral engagement sequence consists of a series of squad-level actions. The procedures in the sequence will vary slightly from situation to situation, but basically will follow the sequence of events shown on page 1-16. An engagement sequence normally begins with an alert warning of approaching enemy targets and ends with their destruction. The M48A1 is IFF equipped. The M48A2 is forward looking infrared (FLIR) equipped.

The squad leader is the fire unit tactical commander. He is responsible for the fire unit's conduct of fire. As a member of an M48A1 squad, he must make the decision to engage. He makes his decision based on visual observation of the target in accordance with the rules contained in FM 44-4, (S)FM 44-1A, and the unit SOP. In M48A2 squads, either the gunner or squad leader may make the engagement decision. This is necessary to make maximum usage of the FLIR subsystem.

CHAPARRAL MISSILE SYSTEM (M48A1)

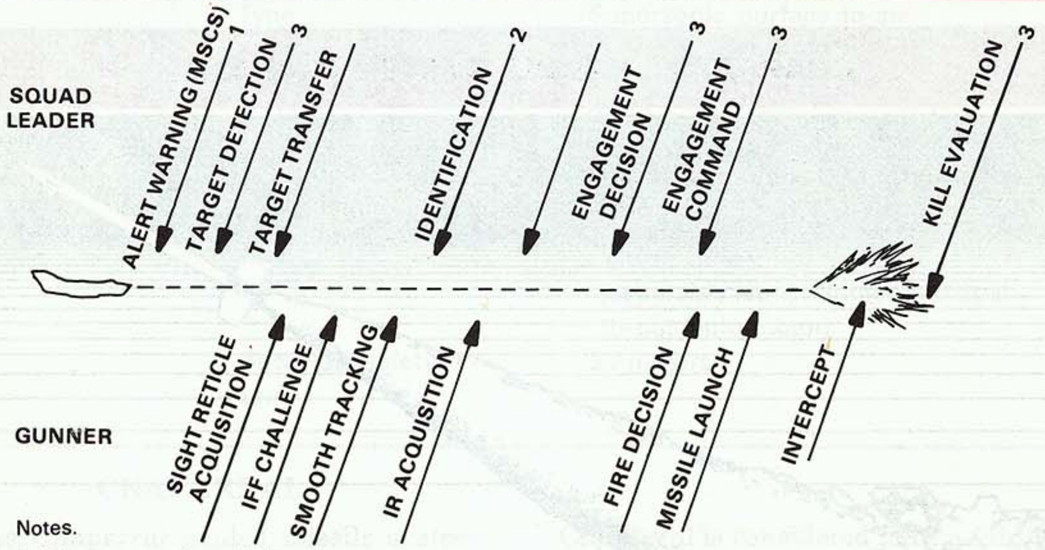


Alert Warning. An alert warning is an early warning or indication of air attack. Warning of the approach of an aircraft increases the chances of successfully engaging it. Once a squad has been alerted, it is cued to the air attack. Cueing information provides azimuth, range, and tentative identification of the target. Cueing information normally follows alert warning, but may accompany it.

Squad Action. The squad receives alerting/cueing information over the forward area alerting radar (FAAR) early warning net in a Manual SHORAD Control System (MSCS) track format. Alerting information by radio can also be obtained over the platoon command net or by monitoring the supported unit's command net; from other squad members by prearranged visual or sound signals; or by intercom when a squad member sees or hears the target without prior warning. When an alert warning is received by the squad leader, he repeats the warning over the intercom.

Target Detection. Anyone in the squad may detect a target. The squad member first detecting the target announces, TARGET, over the intercom. He will follow this with a location statement which includes clock azimuth, altitude in terms of high or low, and if a multiple target the words, MULTIPLE TARGET. Should the gunner detect the target first, the same procedure is followed.

CHAPARRAL ENGAGEMENT SEQUENCE



Notes.

1. May or may not be available.
2. May occur at any time after target detection and before engagement order.
3. For M48A2 squads, may be accomplished by gunner.

FLIR Subsystem

The Chaparral missile system is enhanced with the addition of the FLIR modification (device). The FLIR device enables the gunner to acquire, track, and engage targets during clear weather, at night, and during some adverse weather. Its introduction will change the engagement sequence, giving the gunner the authority to make identification and engagement decisions. The squad leader, may override the gunner's decisions at any time. Generally, the FLIR subsystem operates as follows:

- The infrared receiver images the thermal emission (radiation) from the target. This energy is converted to a video signal that is made TV compatible with the camera/video signal processor, and subsequently displayed on the video display control panel.
- The video display control panel also provides all FLIR subsystem controls.
- The tracking signal processor provides master synchronization for the FLIR subsystem and obtains video signal from the camera/video signal processor. Outputs from the tracking signal processor are azimuth and elevation commands which are routed to the Chaparral fire unit through the electronic interconnect unit.
- Chaparral is best suited for defense of stationary assets to the rear of the maneuver forces. Chaparral has extended range over other SHORAD systems.

CHAPARRAL SYSTEM CHARACTERISTICS

WEIGHT	M730 carrier, noncombat loaded	(14,222 lbs)	6,451 kg
	M730 carrier, combat loaded	(16, 382 lbs)	7,431 kg
	M48A1 Chaparral, noncombat loaded	(22,936 lbs)	10,404 kg
	M48A1 Chaparral, combat loaded	(28,582 lbs)	12,965 kg
DIMENSIONS	Length	6.06 meters	(19 ft, 10½ in)
	Width	2.69 meters	(8 ft, 9¾ in)
	Height (wo cab cover)	1.93 meters	(6 ft, 3 in)
PERFORMANCE	Maximum speed (highway)	(38 mph)	61 kmph
	(cross-country)	(10 mph)	16 kmph
	Cruising range (25 mph) 40 kmph	(300 mi)	483 km
	Turning radius (pivot steering)	(14 ft)	4.3 meters
	Maximum fording depth	Unlimited	
	Maximum forward slope	30°	
	Maximum emplacement slope	10°	
	Fuel capacity (diesel)	112 gal	
LAUNCHING STATION	Number of launch rails	4	
	Backblast safety zone	61 meters	
	Traverse	360°	
	Elevation	-9° to 90°	
	Storage	8 missiles	
	Sight (type)	reflex	
MISSILE	Type	Supersonic, surface-to-air, aerial intercept	
	Weight	(190 lb)	86 kg
	Length	(8.83)	2.9 meters
	Diameter	(5 in)	12.7 cm
	Wing span	(24.8 in)	63 cm
	Guidance	Passive infrared homing, proportional navigation, after optical aiming	
	Warhead	High explosive, fragmentation	
	Motor	Rocket, solid propellant, single-stage	
	Performance	Range beyond 5,000 meters	
	Speed	Supersonic	

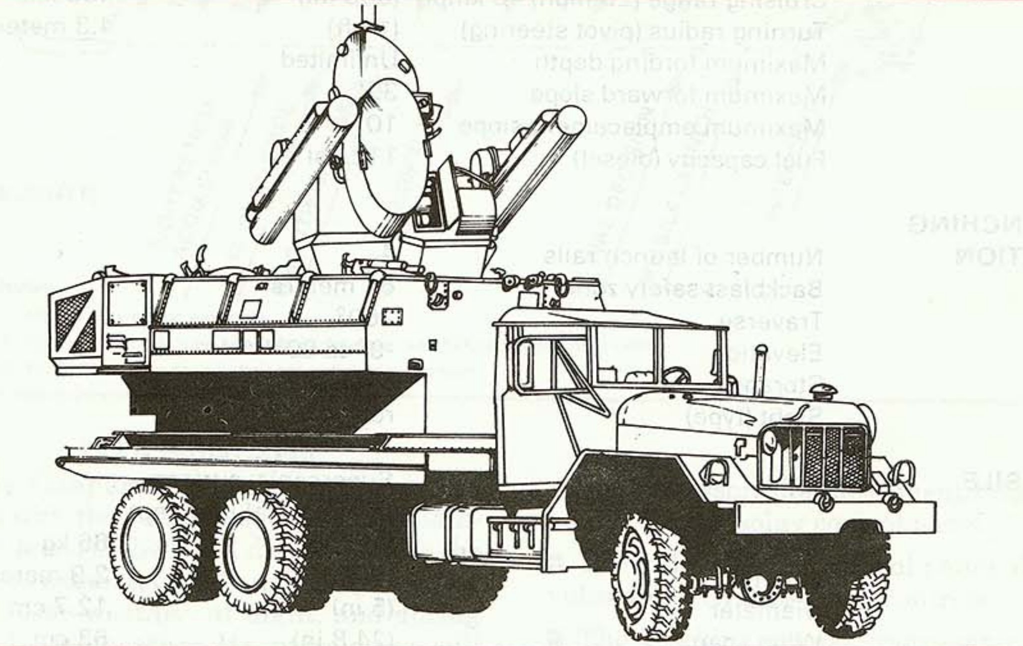
ROLAND

The Roland missile system complements medium- to high-altitude air defense systems. Roland is an all-weather, short-range, air defense missile system. It was developed jointly by France, West Germany, and the United States.

System Description

Originally configured for a track vehicle, the Roland presently is mounted on an M812A1 5-ton truck which is modified to accept a pallet and a loader device. Roland carries a total of 10 certified and sealed rounds with 4 in each of 2 magazines and 2 missiles mounted on the launch rails. Reloading is done automatically. Tracking targets is accomplished with a search and track radar. The system has a mode IV IFF onboard. Targets are displayed on the unit's plan position indicator (PPI) by generated video. The Roland missile can be launched while the module is mounted on the vehicle.

ROLAND MISSILE SYSTEM ON M812A 5-TON TRUCK VEHICLE



System Operation

Roland is designed to track targets while on the move; however, the fire unit must stop to engage targets. Using a pulse-doppler radar, when targets come within range, they are displayed on the commander's PPI. The target can then either be automatically challenged for IFF or interrogation can be done manually by the squad leader. Once the target has been challenged, the computer then categorizes the target as friendly or unknown. The Roland also has visual capabilities with onboard optics. Targets can be engaged with the computer figuring in the elevation and the lead angle. Onboard infrared trackers aligned with the optical sight axis or radar follow the missile's path by means of a heat source on the missile's aft end. Tracking information on the target is automatically generated by the optical sight or radar.

ROLAND SYSTEM CHARACTERISTICS

FIRE UNIT MODULE	Weight, combat	(22,608 lb)	10,255 kg
(DIMENSIONS (antenna folded)			
	Length	(16 ft, 1 in)	4.9 meters
	Width	9 ft, 5 in)	2.9 meters
	Height	(7 ft, 11 in)	2.4 meters
CARRIER PERFORMANCE			
	Maximum speed, (highway)	(40 mph)	64 kmph
	Cruising range	230 miles/370 km	
	Fuel capacity	55 gal	
	Maximum fording depth	(30 in)	76 cm
FIRE UNIT MODULE			
	Number of launch beams	2	
	Traverse	360°	
	*Elevation (optional)	-7° to +78°	
	Storage	10 missiles	
	Sight	Optical/radar	
MISSILE			
	Type	Supersonic, containerized	
	Weight (w/o launch tube)	(146.8 lb)	66.6 kg
	Length	(94.4 in)	2.4 cm
	Diameter	(6.3 in) (body)	16 cm
	Guidance	Command guidance; optical radar—optical tracking	
	Warhead	High energy explosive device	
	Performance	Range over 6 km	
	Speed	Supersonic	
AIR TRANSPORTABILITY			
	C130 - 1 fire unit module or 1 prime mover.		
	C141 - 1 fire unit module and 1 prime mover.		
	C5A - 2 fire unit modules and 2 prime movers.		

*Limits at -15° to 89°. The system goes into hydraulic lock and must be reset manually.

The US Roland system will be fielded by the New Mexico National Guard, and will be manned at 78 percent of its strength on a full-time basis.

CHAPTER 2

HIMAD Systems

High-to-medium-altitude air defense (HIMAD) systems include the Nike Hercules, the Patriot and the Hawk missile system. HIMAD missile systems are deployed to defend the theater/corps commanders' high priority assets against hostile aircraft. HIMAD systems could be assigned to corps/divisions when available to provide air defense coverage for corps/division assets against high speed aircraft.

NIKE HERCULES

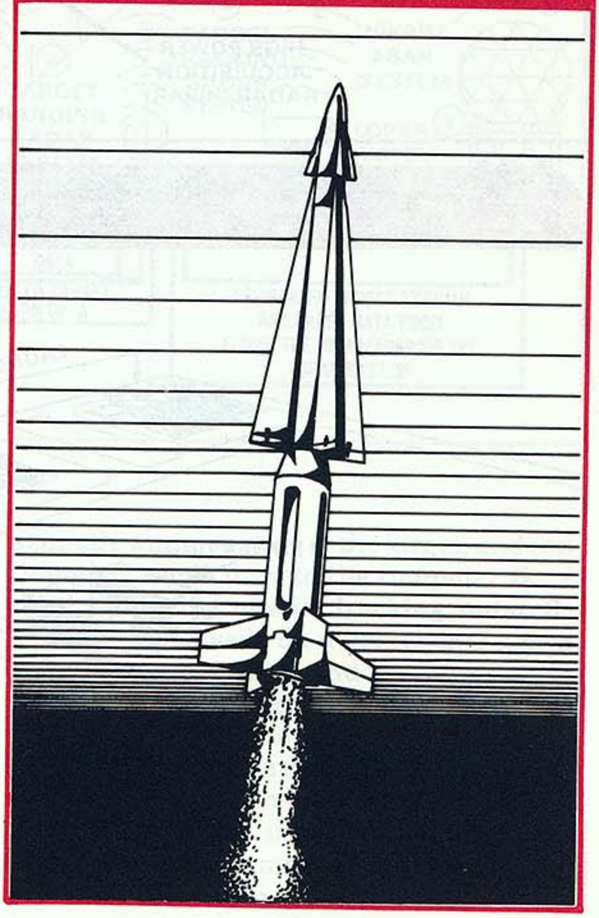
The Nike Hercules guided missile system is an Army long-range, surface-to-air defense missile system. Nike Hercules is a surface-to-air system; however, it also has a surface-to-surface capability. The Nike Hercules has a high explosive (HE) and nuclear warhead capability.

SYSTEM DESCRIPTION

The Nike Hercules is an all-weather system. It can engage airborne targets at 2,100 miles per hour (approximately) at ranges greater than 121 kilometers (75 miles) and at altitudes up to 100,000 feet.

The Nike Hercules battery is deployed in the semimobile configuration; however, in a static situation, system components may be installed in a permanent or semipermanent emplacement. Nike Hercules guided missile systems are emplaced in the battery control and launching control areas. The system's major components in these two areas are shown in illustrations on page 2-2. This system can be transported by rail or ship, and can be airlifted by C-5 aircraft.

NIKE HERCULES IN A FIRING ATTITUDE



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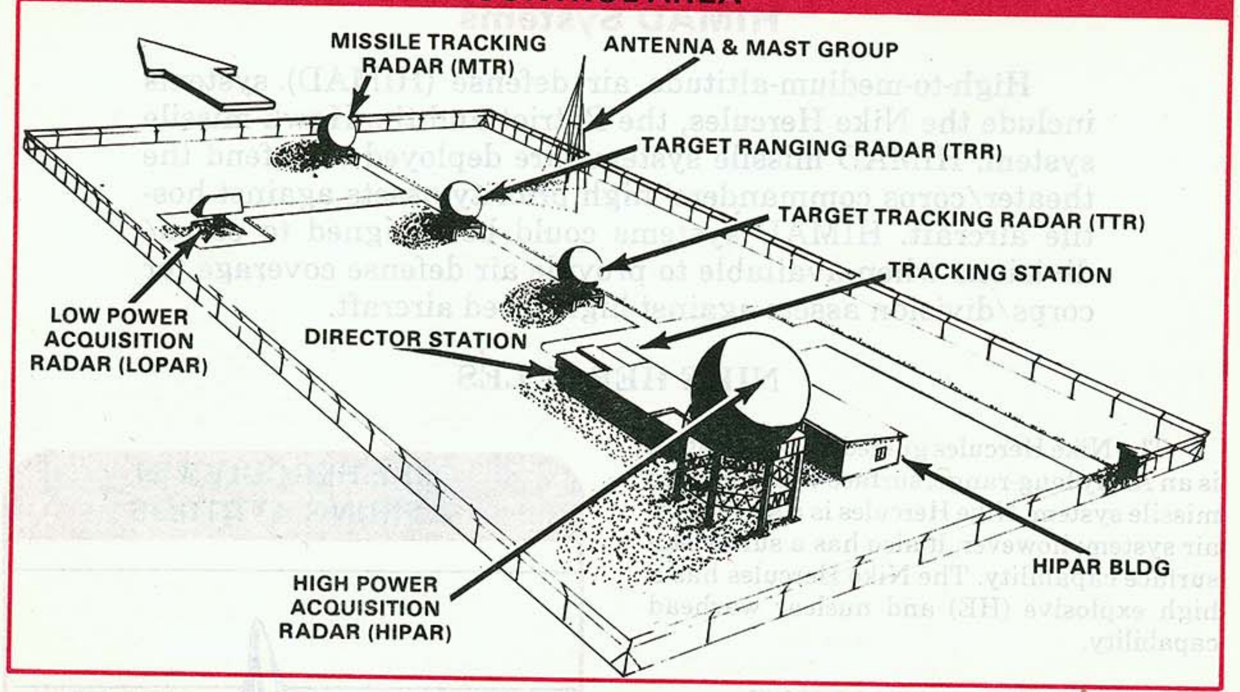
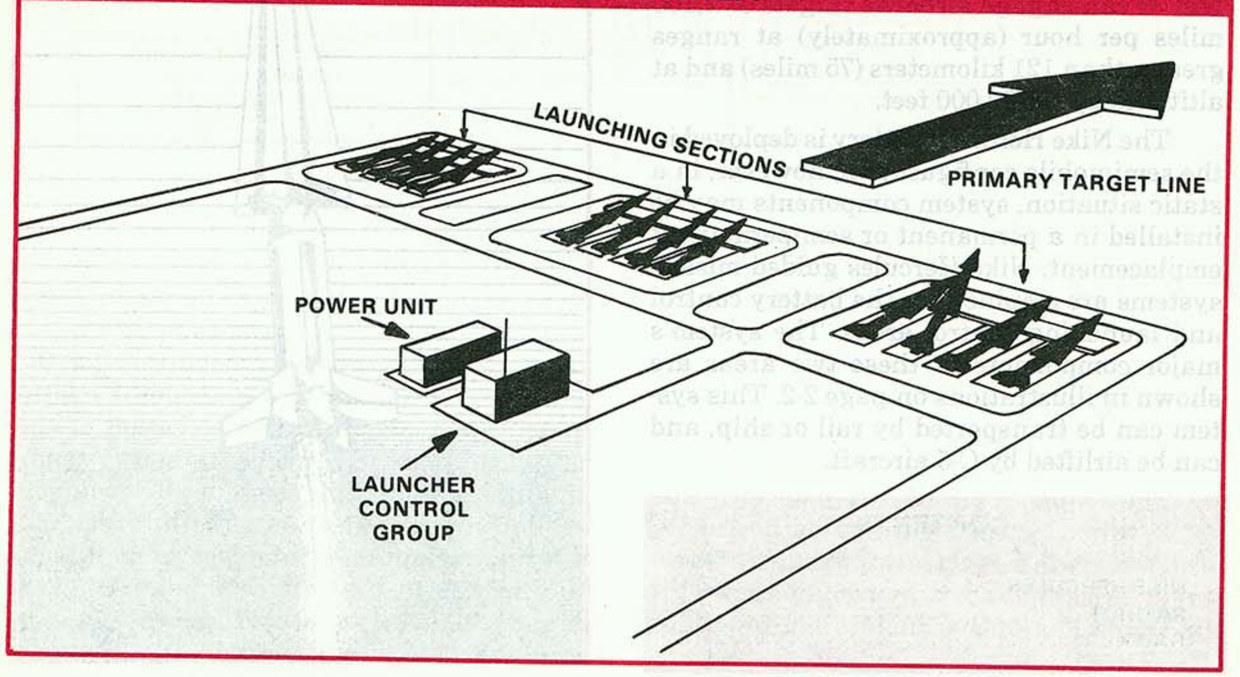
NIKE HERCULES 2-1
PATRIOT 2-5
HAWK 2-10

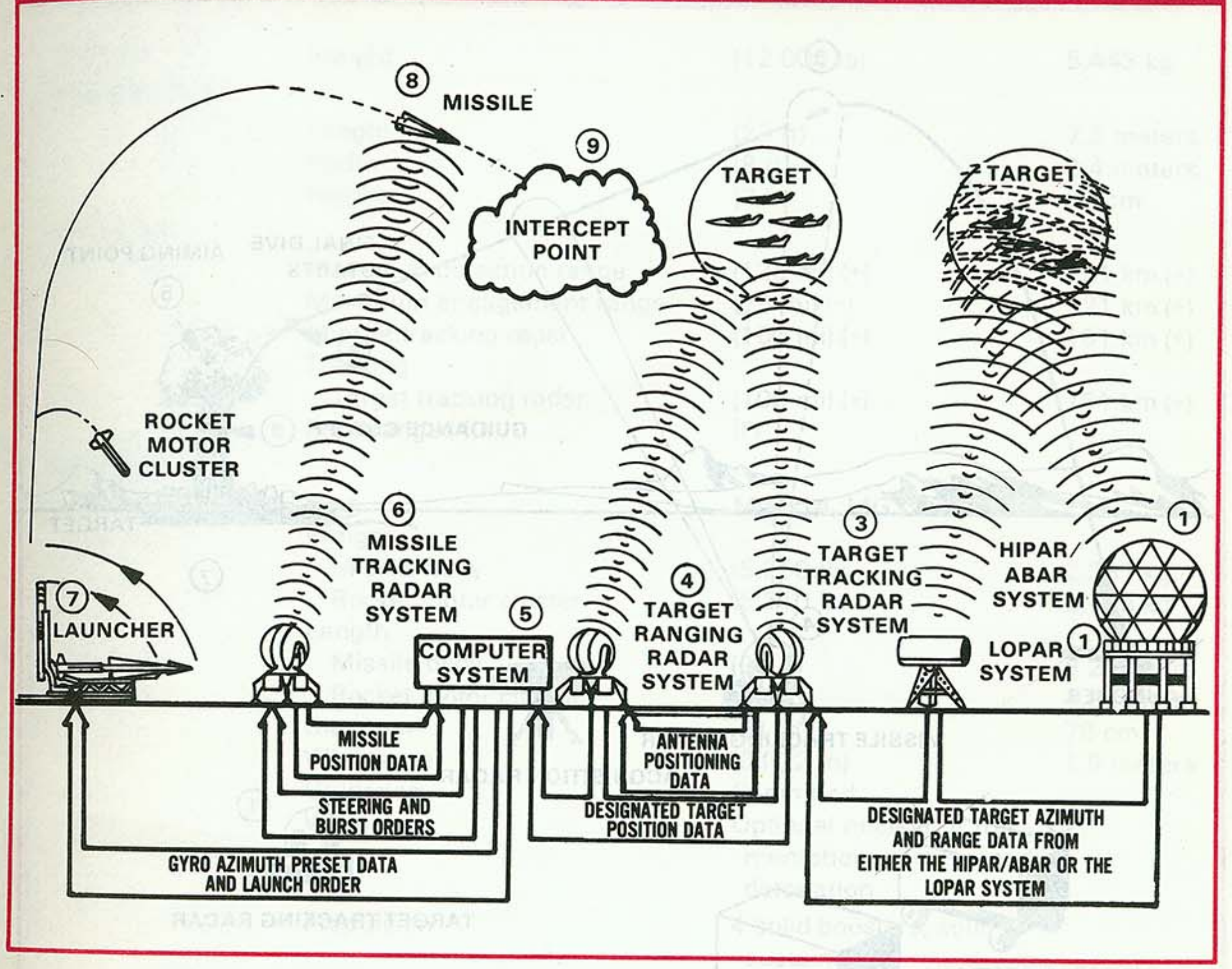
NIKE HERCULES BATTERY CONTROL AREA


MISSILE TRACKING RADAR (MTR)
ANTENNA & MAST GROUP
TARGET RANGING RADAR (TRR)
TARGET TRACKING RADAR (TTR)
TRACKING STATION
LOW POWER ACQUISITION RADAR (LOPAR)
DIRECTOR STATION
HIPAR BLDG
HIGH POWER ACQUISITION RADAR (HIPAR)

NIKE HERCULES LAUNCHING CONTROL AREA



NIKE HERCULES SURFACE-TO-AIR ENGAGEMENT SEQUENCE


⑧ MISSILE
⑨ INTERCEPT POINT
TARGET
TARGET
ROCKET MOTOR CLUSTER
⑥ MISSILE TRACKING RADAR SYSTEM
⑦ LAUNCHER
⑤ COMPUTER SYSTEM
④ TARGET RANGING RADAR SYSTEM
③ TARGET TRACKING RADAR SYSTEM
① HIPAR/ ABAR SYSTEM
① LOPAR SYSTEM
MISSILE POSITION DATA
STEERING AND BURST ORDERS
GYRO AZIMUTH PRESET DATA AND LAUNCH ORDER
ANTENNA POSITIONING DATA
DESIGNATED TARGET POSITION DATA
DESIGNATED TARGET AZIMUTH AND RANGE DATA FROM EITHER THE HIPAR/ABAR OR THE LOPAR SYSTEM

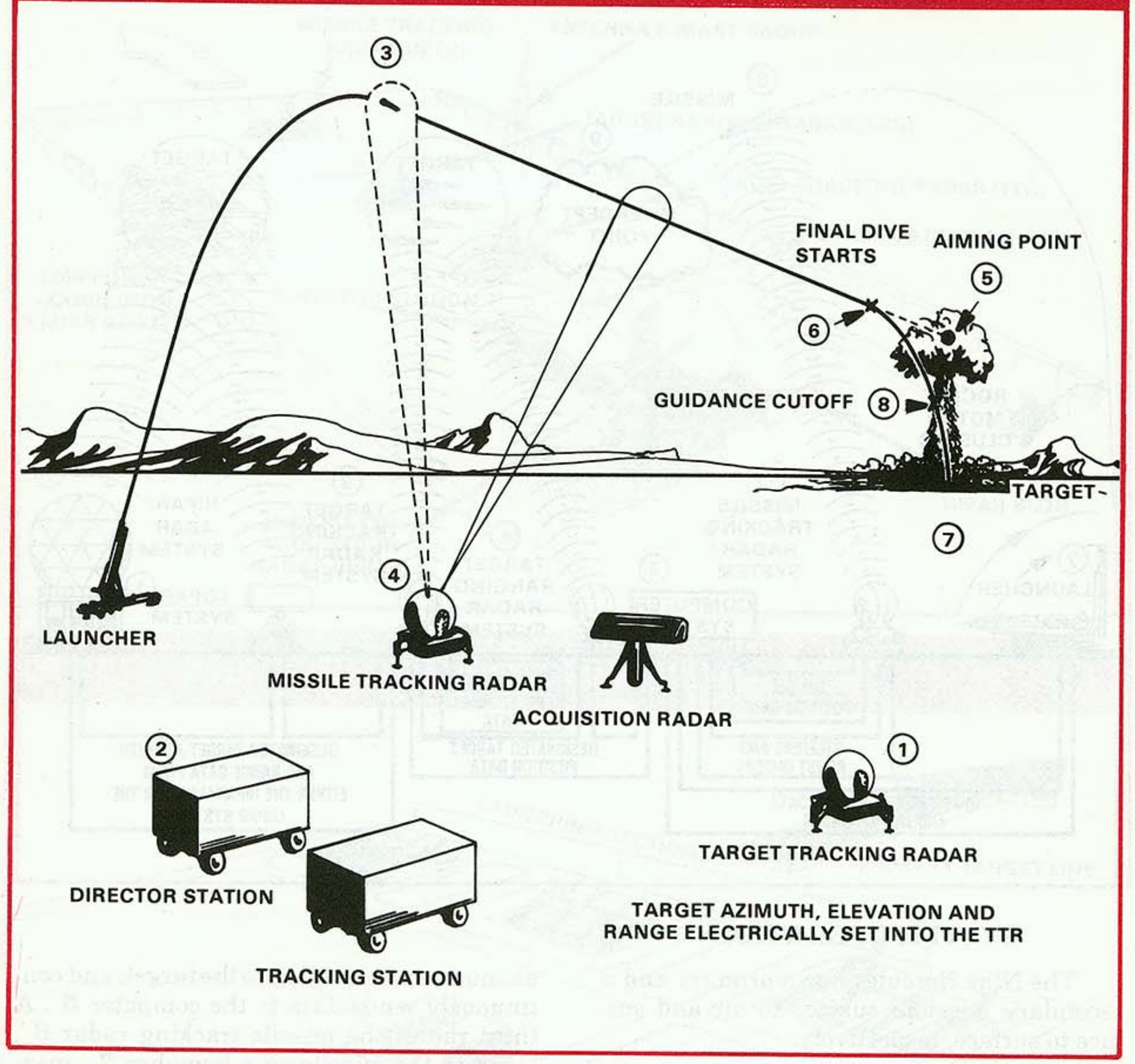
SYSTEM OPERATION

The Nike Hercules has a primary and a secondary mission: surface to air and surface to surface, respectively.

Surface-To-Air Mission

The acquisition radars **1** detect the target **2** which, when identified as hostile, is designated to a target tracking radar **3** . The target tracking radar, in conjunction with the target ranging radar **4** , acquires and tracks the target; measures range, speed, azimuth, and elevation to the target; and continuously sends data to the computer **5** . A third radar, the missile tracking radar **6** , locks on the missile on a launcher **7** , measures range, azimuth, and elevation of the missile in flight **8** , and continuously sends this information to the computer. The computer, knowing the location of both target and missile, computes an intercept point, directs the missile to the intercept point **9** , and causes the burst command to be sent to the missile at the proper time.

NIKE HERCULES SURFACE-TO-SURFACE ENGAGEMENT SEQUENCE



Surface-To-Surface Mission

Target range, azimuth, and elevation are set into the target tracking radar **1** and dial settings are made on the computer **2** . The missile is fired **3** , tracked by the missile tracking radar **4** , and steered toward an aiming point above the target **5** . At the proper instant, the missile is given a dive command **6** to position it in the proper attitude to hit the target **7** . After the dive command is executed, the missile tracking radar ceases tracking **8** and the missile continues to the target on a ballistic trajectory.

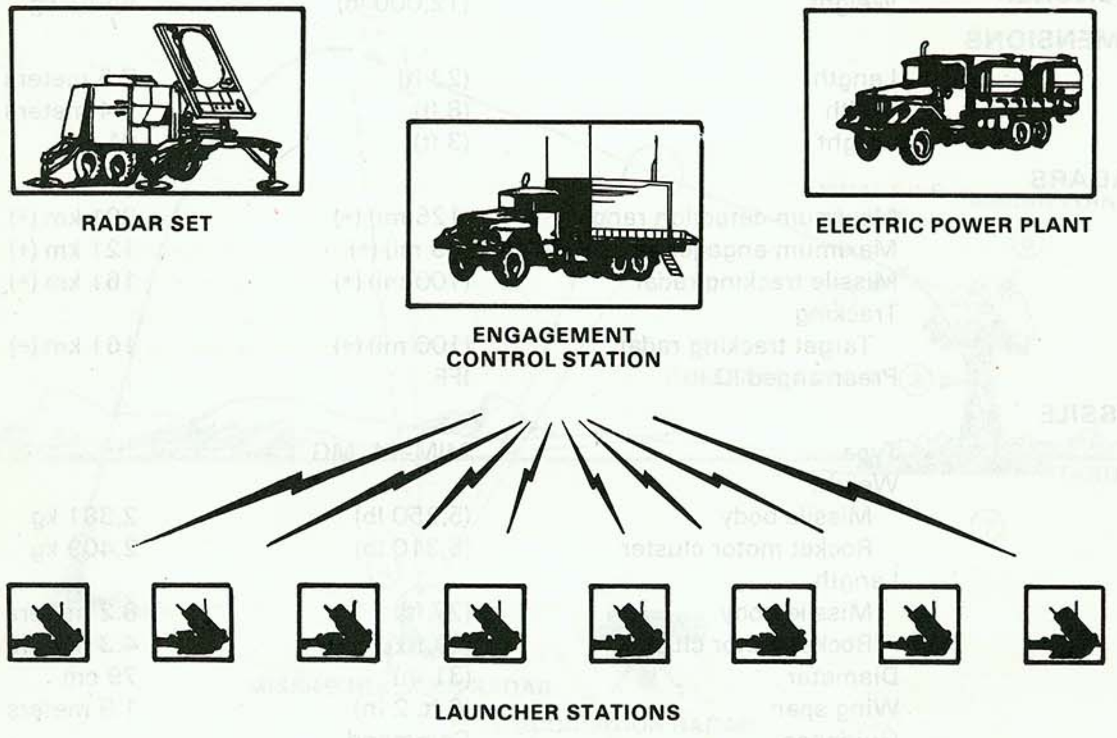
NIKE HERCULES SYSTEM CHARACTERISTICS

LAUNCHER	Weight	(12,000 lb)	5,443 kg
DIMENSIONS			
	Length	(23 ft)	7.5 meters
	Width	(8 ft)	2.4 meters
	Height	(3 ft)	91 cm
RADARS			
	Maximum detection range	(125 mi) (+)	201 km (+)
	Maximum engagement range	(75 mi) (+)	121 km (+)
	Missile tracking radar	(100 mi) (+)	161 km (+)
	Tracking		
	Target tracking radar	(100 mi) (+)	161 km (+)
	Prearranged ID	IFF	
MISSILE			
	Type	MIM-14, MG	
	Weight		
	Missile body	(5,250 lb)	2,381 kg
	Rocket motor cluster	(5,310 lb)	2,409 kg
	Length		
	Missile body	(27 ft)	8.2 meters
	Rocket motor cluster	(14 ft)	4.3 meters
	Diameter	(31 in)	79 cm
	Wing span	(6 ft, 2 in)	1.9 meters
	Guidance	Command	
	Warhead	Optional nuclear or fragmentation w/command detonation	
	Propulsion	4 solid boosters, solid sustainer	
	Speed	2,100 meters per second (MPS) (mach 3)	

PATRIOT

The Patriot missile system is designed for maximum effectiveness against the air threat anticipated in the 1980s and beyond. The Patriot missile system has the role of providing very-low- to very-high-altitude air defense of ground combat forces and critical assets. The system is designed to replace US Nike Hercules and most of the Hawk missile systems. The Patriot system performs its mission with less tactical equipment, greater fire power, improved electronic counter-countermeasures (ECCM) capability, 100 percent mobility, and simplified logistics and maintenance. Patriot requires fewer major end items of equipment and personnel than previous air defense systems.

PATRIOT MISSILE SYSTEM (LESS THE ANTENNA MAST GROUP)



SYSTEM DESCRIPTION

The Patriot missile system can—

- Engage and destroy threat aircraft operating at all tactical speeds and altitudes.
- Deliver sufficient fire power to counter threat saturation attacks.
- Operate at night and under conditions of adverse weather or reduced visibility.
- Function effectively in an ECM environment.
- Move about the battlefield using organic wheeled vehicles.

The system can be transported by rail or ship and can be airlifted by C-141 with disassembly, and C-5 aircraft without alteration.

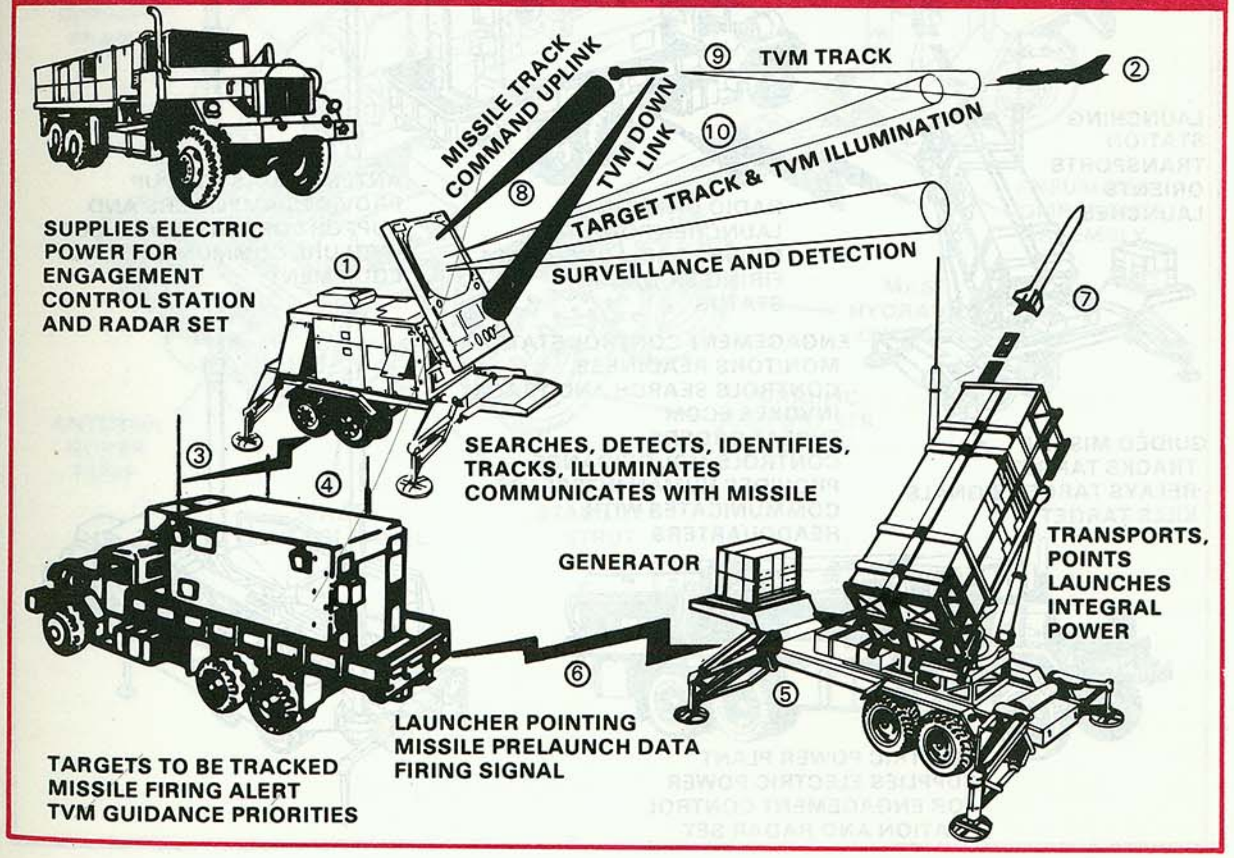
The Patriot system consists of the following major items of equipment:

- Radar set.
- Engagement control station.
- Electric power plant.
- Launching stations.
- Antenna mast group.

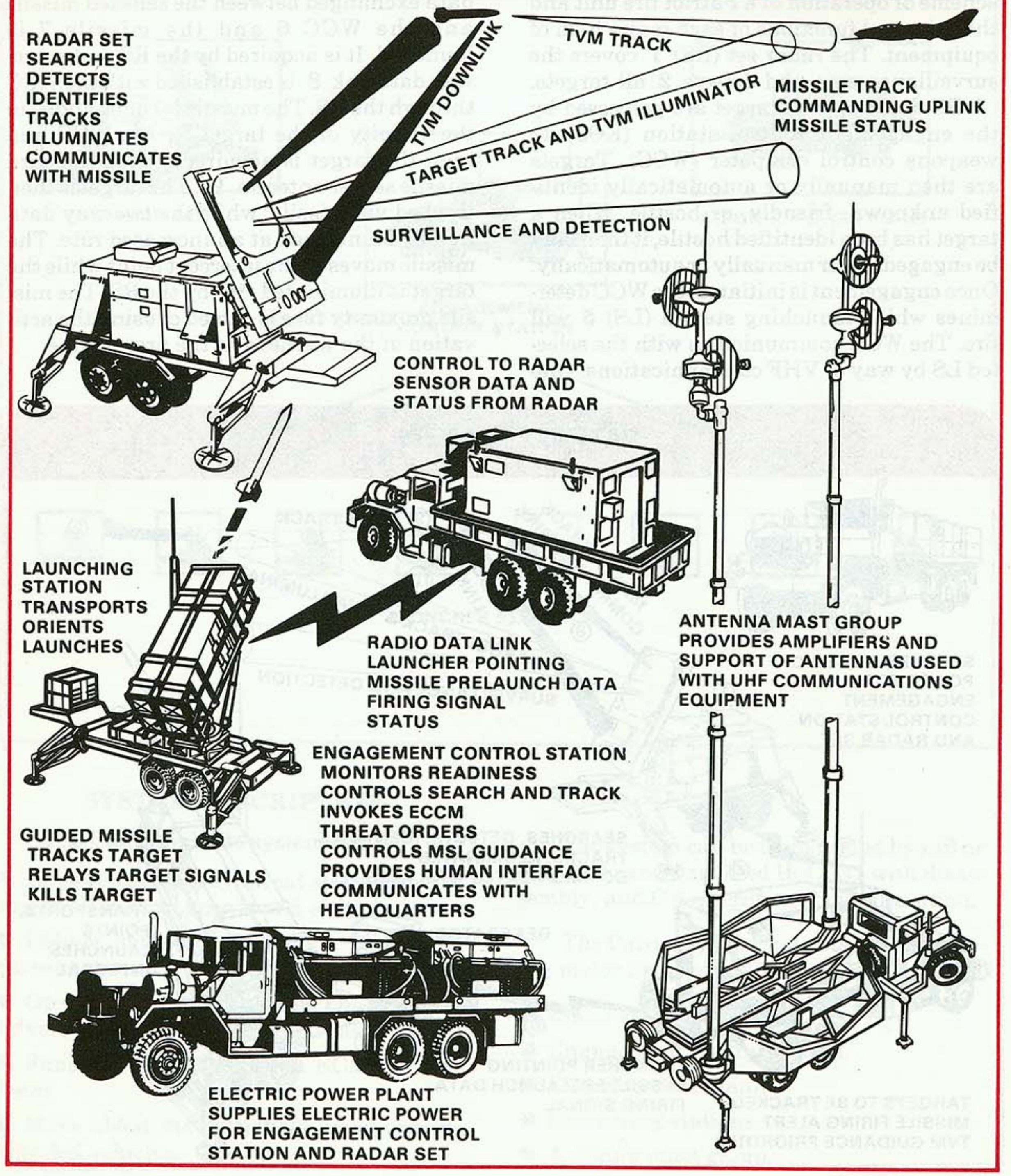
SYSTEM OPERATION

The following two illustrations show the scheme of operation of a Patriot fire unit and the principal functions of each major item of equipment. The radar set (RS) **1** covers the surveillance area and detects **2** all targets. **3** RS data on each target are processed by the engagement control station (ECS) **4** weapons control computer (WCC). Targets are then manually or automatically identified unknown, friendly, or hostile. When a target has been identified hostile, it then may be engaged either manually or automatically. Once engagement is initiated, the WCC determines which launching station (LS) **5** will fire. The WCC communicates with the selected LS by way of VHF communications. One of the selected LS's missiles is then activated, data exchanged between the selected missile and the WCC **6** and the missile **7** is launched. It is acquired by the RS and a two-way data link **8** is established with the WCC through the RS. The missile is commanded to the vicinity of the target by the WCC and then the target is acquired by the onboard missile seeker antenna **9**. The target is then tracked via missile, while the two-way data link is maintained at an increased rate. The missile moves to the intercept point while the target is illuminated **10** by the RS. The missile proximity fuze is armed causing the activation of the warhead at the proper time.

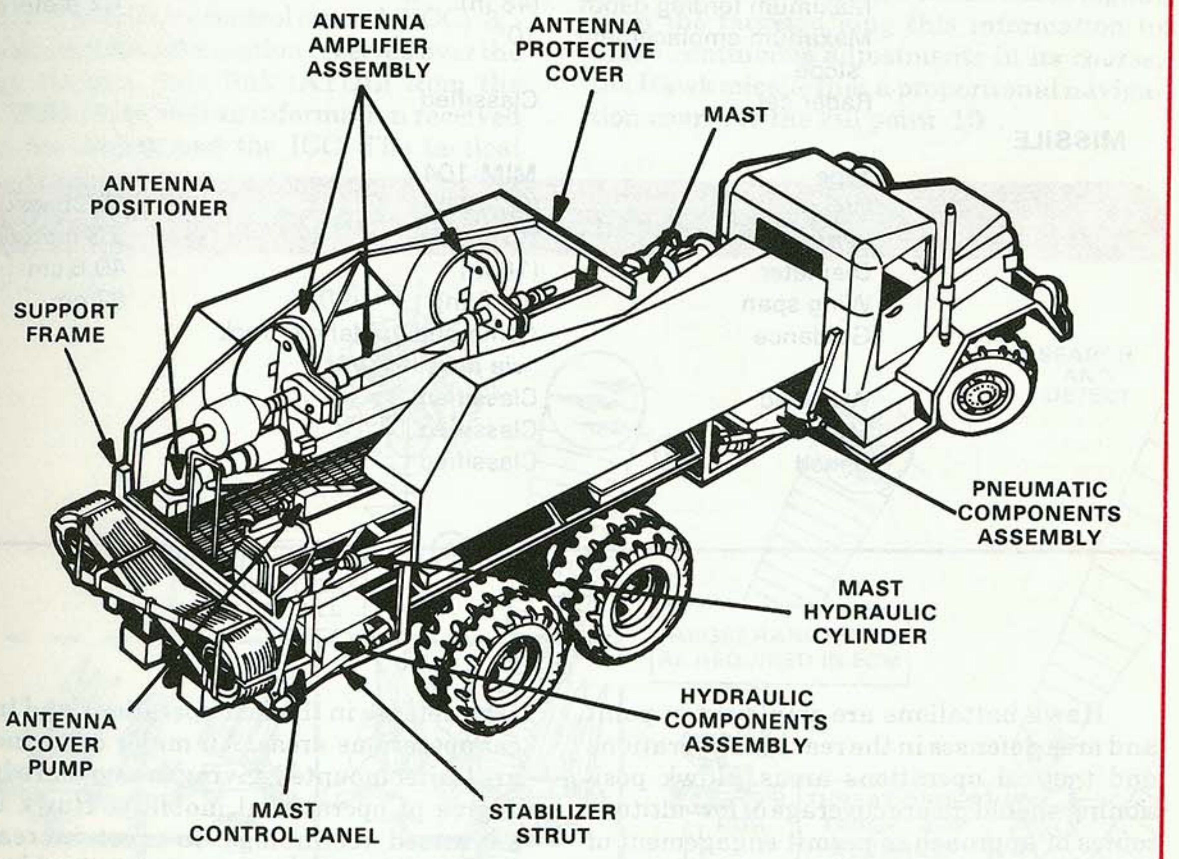
PATRIOT SYSTEM


⑨ TVM TRACK
②
MISSILE TRACK COMMAND UPLINK
⑧
TVM DOWN LINK
⑩
TARGET TRACK & TVM ILLUMINATION
SURVEILLANCE AND DETECTION
①
SUPPLIES ELECTRIC POWER FOR ENGAGEMENT CONTROL STATION AND RADAR SET
⑦
SEARCHES, DETECTS, IDENTIFIES, TRACKS, ILLUMINATES COMMUNICATES WITH MISSILE
③
④
GENERATOR
TRANSPORTS, POINTS LAUNCHES INTEGRAL POWER
⑥
⑤
LAUNCHER POINTING MISSILE PRELAUNCH DATA FIRING SIGNAL
TARGETS TO BE TRACKED MISSILE FIRING ALERT TVM GUIDANCE PRIORITIES

PATRIOT FIRE UNIT OPERATIONS



PATRIOT ANTENNA MAST GROUP



PATRIOT SYSTEM CHARACTERISTICS

LAUNCHER STATION			
	Weight	(85,547 lb) (w/vehicle M983 & 4 msls)	38,803 kg
DIMENSIONS			
	Length	(54 ft, 11 in) (w/vehicle)	16.8 meters
	Width	(9 ft, 5 in)	2.9 meters
	Height	(8 ft, 6 in) (w/4 msls)	2.6 meters
	Maximum fording depth	(48 in)	1.2 meters
	Maximum emplacement slope	10°	
	Radar set	Classified	
MISSILE			
	Type	MIM-104	
	Weight	(3,740 lb)	1,696 kg
	Length	(17 ft, 5 in)	5.3 meters
	Diameter	(16 in)	40.6 cm
	Wing span	(34.3 in)	87 cm
	Guidance	Command guidance/track via missile (TVM)	
	Warhead	Classified	
	Motor	Classified	
	Speed	Classified	

HAWK

Hawk battalions are employed in point and area defenses in the rear area operations and tactical operations areas. Hawk positioning should insure coverage of low-altitude routes of approach to permit engagement of aircraft as far forward of the defended area as possible.

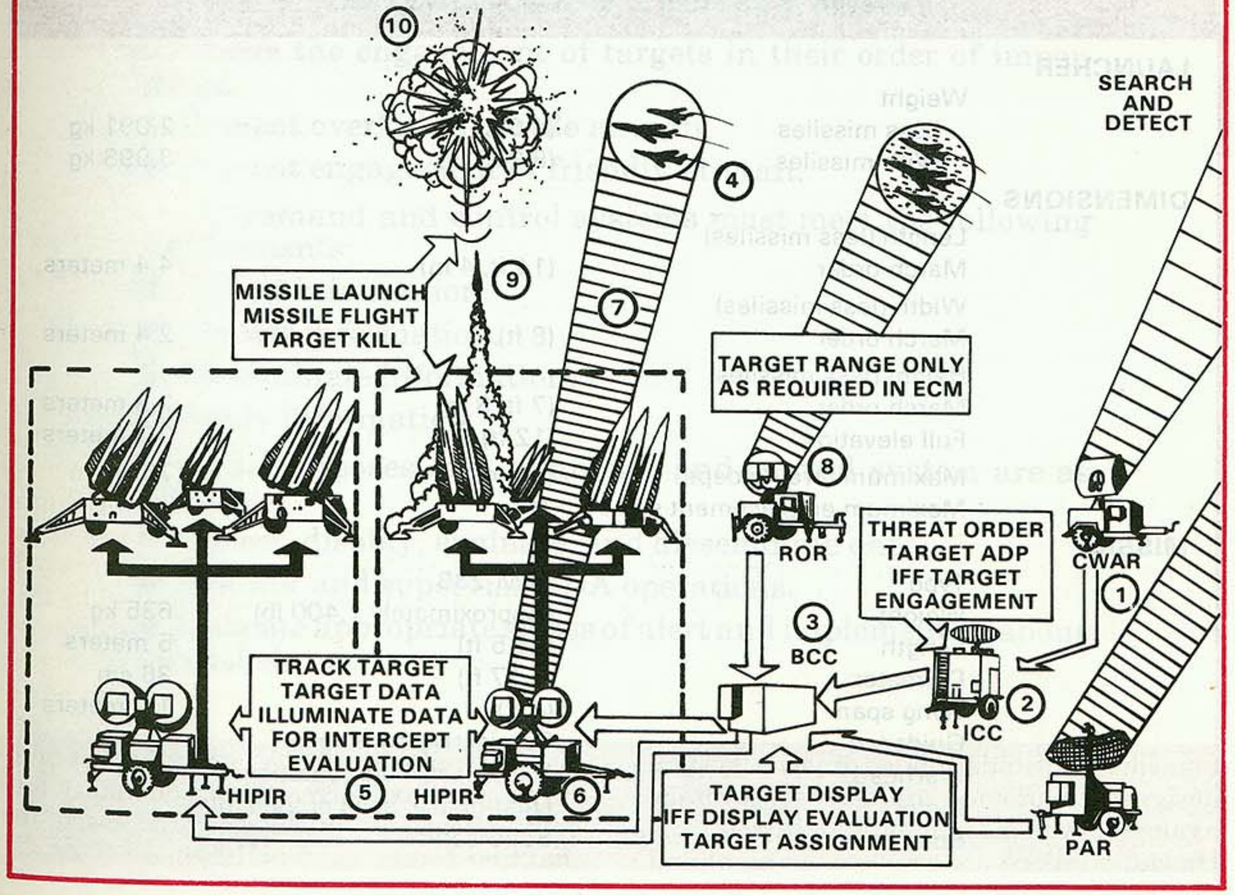
SYSTEM DESCRIPTION

The Hawk missile system is a very-low-to-medium-altitude guided missile system designed to provide air defense coverage against low-to-medium-altitude air attack. Hawk battalions are employed in point and area defense in the rear operations and tactical operations areas. All major components are trailer mounted, giving the system a high degree of operational mobility. Hawk uses advanced technology to meet increased threats. Most Hawk units are retained by the area air defense commander for use in defending theater priorities. Basically, the system is employed in the battery configuration; however, during the 1985-1987 time frame, the system employment may be by platoons and Hawk will have increased responsibility for point defense of critical rear area assets in that time frame.

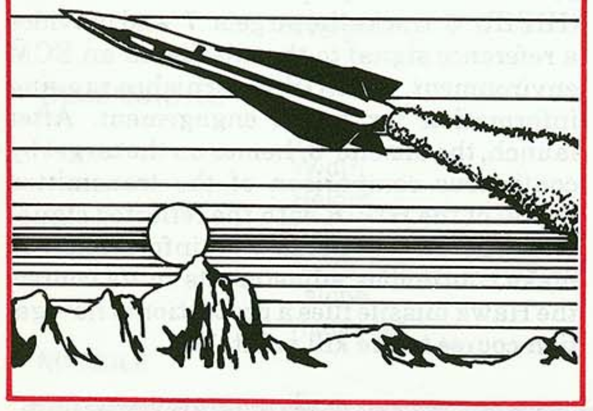
SYSTEM OPERATION

The Hawk system detects targets with two types of acquisition radar **1** . The continuous-wave acquisition radar (CWAR) provides low-to-medium-altitude detection coverage. The pulse acquisition radar (PAR) provides medium-to-high-altitude, medium-range detection coverage. Following detection, the information coordination central (ICC) **2** allows for target IFF, and automatic data processing (ADP) of target information. The battery control central (BCC) **3** - displays target information received over the Army tactical data link (ATDL) from the AN/TSQ-73, as well as information received from the radars and the ICC. The tactical control officer (in the BCC) selects targets **4**- for engagement and assigns them to a firing section **5** . The high-power illuminator radar (HIPIR) **6** tracks the targets **7** and provides a reference signal to the missile. In an ECM environment, the ROR **8** furnishes ranging information for target engagement. After launch, the missile **9** homes on the target by continuous comparison of the transmitted signal of the HIPIR with the reflected signal from the target. Using this information to make continuous adjustments in its course, the Hawk missile flies a proportional navigation course to the kill point **10** .

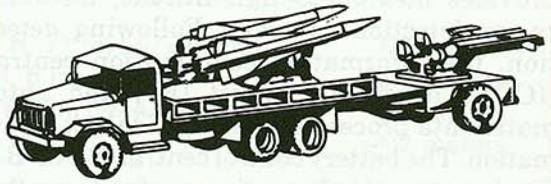
HAWK MISSILE ENGAGEMENT SEQUENCE


⑩
SEARCH AND DETECT
④
⑨
MISSILE LAUNCH MISSILE FLIGHT TARGET KILL
⑦
TARGET RANGE ONLY AS REQUIRED IN ECM
⑧
ROR
THREAT ORDER TARGET ADP IFF TARGET ENGAGEMENT
CWAR
①
③
BCC
②
ICC
TRACK TARGET TARGET DATA ILLUMINATE DATA FOR INTERCEPT EVALUATION
HIPIR
⑤
HIPIR
⑥
TARGET DISPLAY IFF DISPLAY EVALUATION TARGET ASSIGNMENT
PAR

HAWK AIR DEFENSE GUIDED MISSILE



HAWK MISSILE AND LAUNCHER



HAWK SYSTEM CHARACTERISTICS

LAUNCHER			
	Weight		
	Less missiles	(4,610 lb)	2,091 kg
	With missiles	(8,813 lb)	3,998 kg
DIMENSIONS			
	Length (less missiles)		
	March order	(14 ft, 4 in)	4.4 meters
	Width (less missiles)		
	March order	(8 ft)	2.4 meters
	Height (less missiles)		
	March order	(7 ft, 8 in)	2.3 meters
	Full elevation	(12 ft)	3.7 meters
	Maximum fording depth	(30 in)	76 cm
	Maximum emplacement slope	10°	
MISSILE			
	Type	MIM-23B	
	Weight	(Approximately 1,400 lb)	635 kg
	Length	(16.5 ft)	5 meters
	Diameter	(1.17 ft)	36 cm
	Wing span	(4 ft)	1.2 meters
	Guidance	Semiactive homing	
	Warhead	H.E., blast, fragmentation	
	Motor	Dual-phase, solid propellant	
	Speed	Supersonic	

CHAPTER 3

Command and Control Systems

Long- and medium-range ADA weapons, such as Nike Hercules, Patriot, and Hawk, operate within a command and control system that is tied in with higher level air defense control facilities. This tie-in provides for the exchange of aircraft track information on, and direct assignment of, hostile aircraft for engagement by these weapons. Elements of the command and control system are established and employed at all levels from the brigade to the fire units. The use, requirements, and purposes of a command and control system are well established.

Command and control systems are used as follows:

- Insure the engagement of targets in their order of importance.
- Prevent overkill of hostile aircraft.
- Prevent engagement of friendly aircraft.

Command and control systems must meet the following requirements:

- Collect information.
- Process information.
- Disseminate information.
- Apply information.

The purposes of a command and control system are as follows:

- Collect, display, evaluate, and disseminate data.
- Monitor and supervise ADA operations.
- Indicate appropriate states of alert and implement weapons control status.

CONTENTS

	Page		Page
MISSILE MINDER AN/TSQ-73	3-2	DATA CONVERTER AN/GSA-77	3-4

- Direct and coordinate the firing of ADA units during the air battle.
- Exchange data on air defense activities with interested agencies.
- Act as a center for liaison and coordination.

MISSILE MINDER AN/TSQ-73

The command and control system Missile Minder AN/TSQ-73 performs fire direction functions for Hawk and Patriot units. Also, the AN/TSQ-73 has two data link capabilities: ATDL-1 to link with fire units and TADIL-B to link with Air Force control and reporting center (CRC) or other higher sources.

SYSTEM DESCRIPTION

The Missile Minder employs advanced electronic technology; it is self-contained, fully automated, and easily transported. The system is available in two configurations: the brigade-level system normally assigned to a brigade having HIMAD battalions and the battalion-level system assigned to Hawk and Hercules battalions. At battalion level the actual direction of the air defense battle occurs. These functions include real-time functions of target detection, target tracking, and command and control of firing batteries for engagement.

The Missile Minder system consists of the following major subsystems:

- Radar interface equipment.
- Automatic data processing equipment.
- Communications equipment.
- Display equipment.
- Power equipment.

The subsystems are enclosed in one air-portable shelter. Within the shelter are maintenance and repair facilities and equipment to include a work bench, storage for reference material and spare parts, and tools and test equipment for user maintenance.

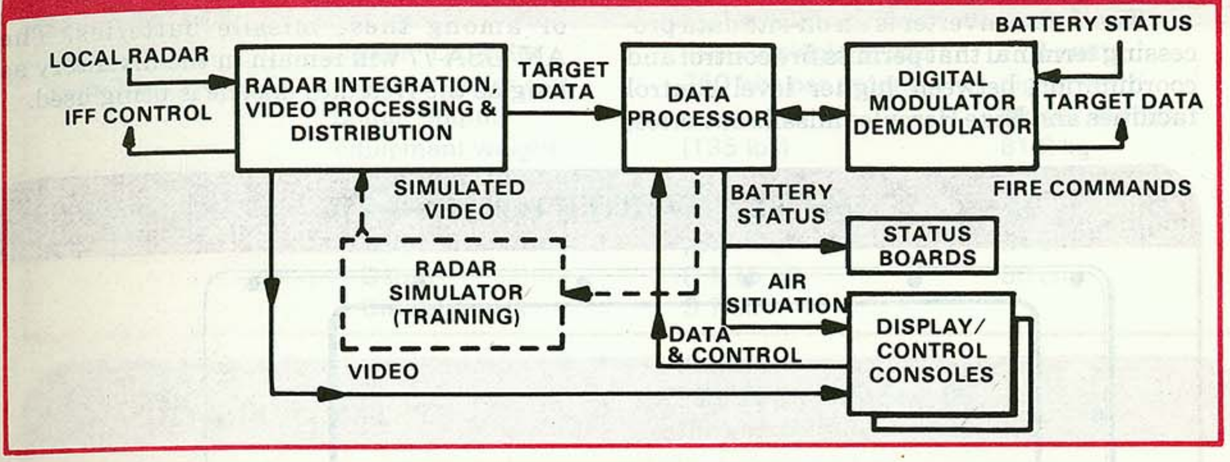
SYSTEM OPERATION

The Missile Minder performs the functions of target track correlation, IFF display threat evaluation, weapon assignment, data exchange with other systems, and target simulation for training. A simplified flow chart illustrating the sequence of functions performed by the AN/TSQ-73 Missile Minder is shown in illustration below. There is also a status board which displays real-time fire unit status.

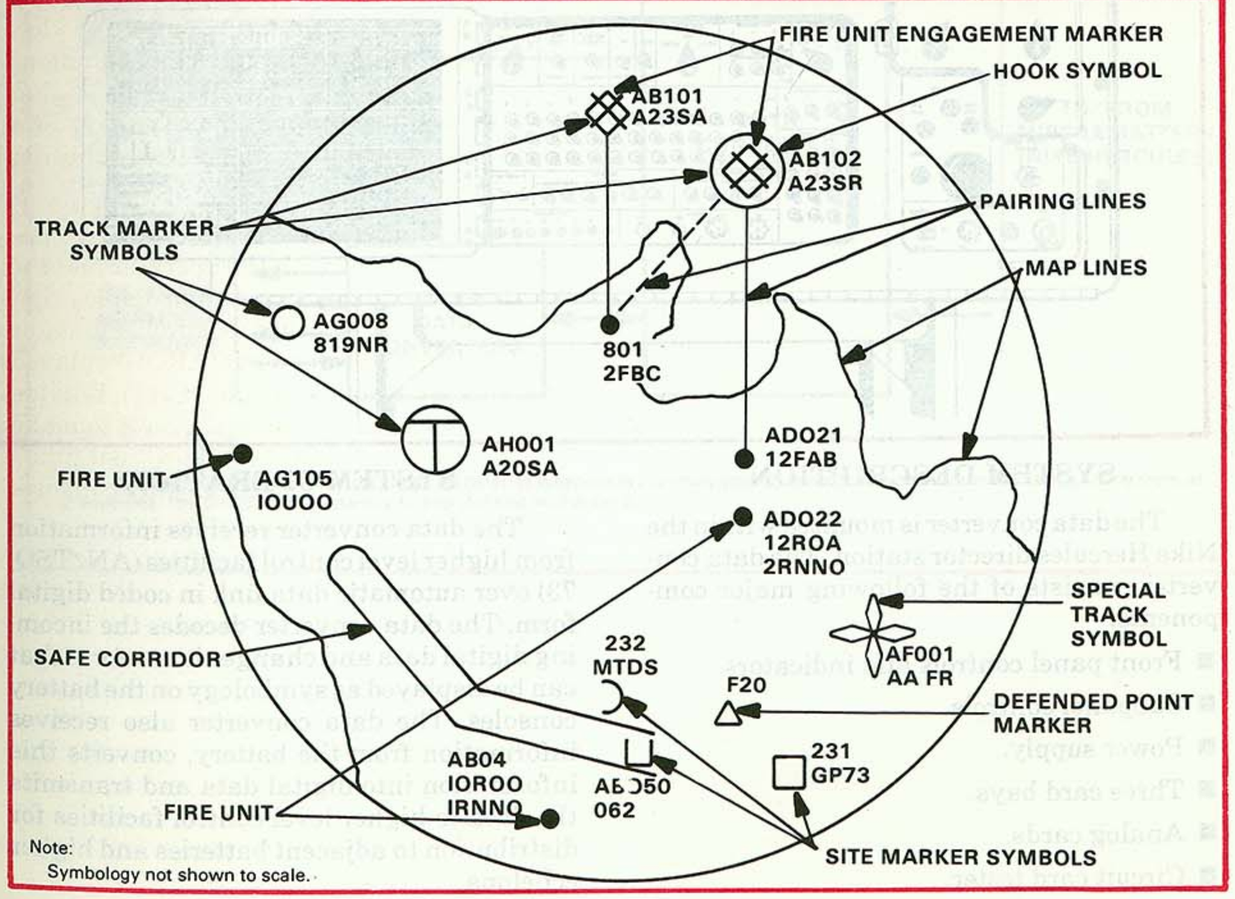
The display consoles provide the primary interface between the operator and the AN/TSQ-73 system. Two station display consoles, with both planned position indicator (PPI) and auxiliary read-out (ARO) displayed on a single cathode ray tube (CRT), provide the operator with the essential data to make fast, accurate decisions based on "real-time" displayed information. The display consoles provide the following display data:

- Track positions.
- Weapon positions.
- Maps.
- Jam strobes.
- Velocity vectors.
- Safe corridors.
- Pairing lines.
- Defended areas and points.

AN/TSQ-73 DATA FLOW CHART



AN/TSQ-73 TYPICAL TACTICAL DEFENDED AREAS AND POINTS DISPLAY

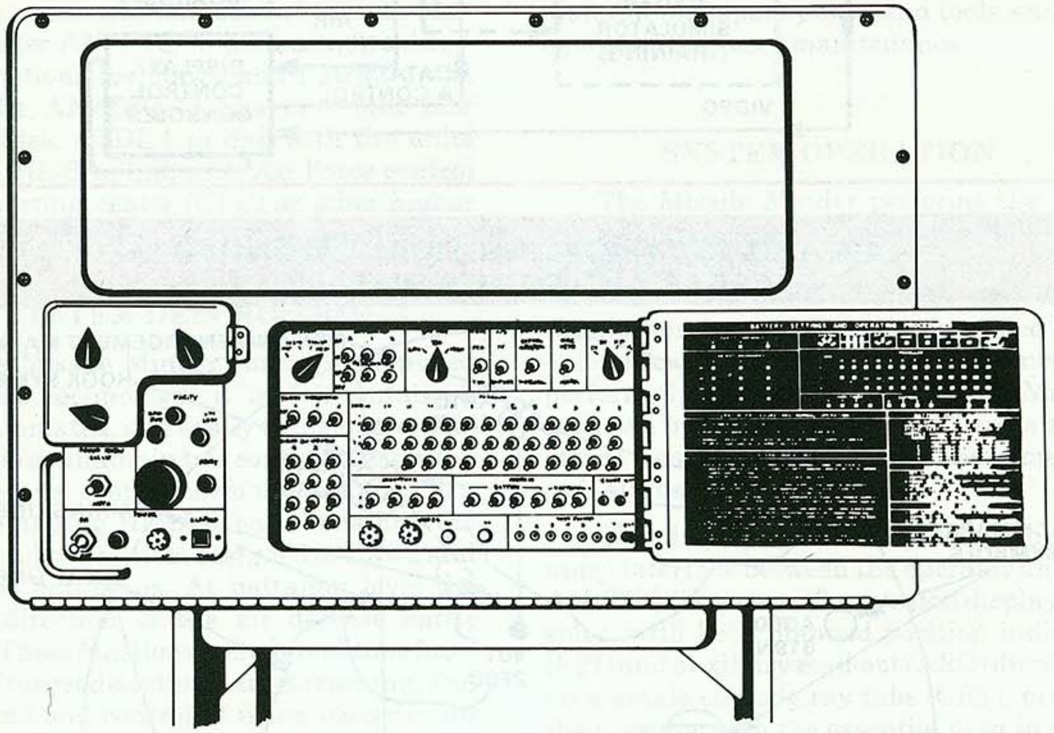


Note:
Symbology not shown to scale.

DATA CONVERTER AN/GSA-77

The data converter is an on-site data processing terminal that permits fire control and coordination between higher level control facilities and Nike Hercules missile batteries, or among these missile batteries. The AN/GSA-77 will remain in the inventory as long as the Hercules missile is being used.

DATA CONVERTER (AN/GSA-77)



SYSTEM DESCRIPTION

The data converter is mounted within the Nike Hercules director station. The data converter consists of the following major components:

- Front panel controls and indicators.
- Subpanel controls.
- Power supply.
- Three card bays.
- Analog cards.
- Circuit card tester.

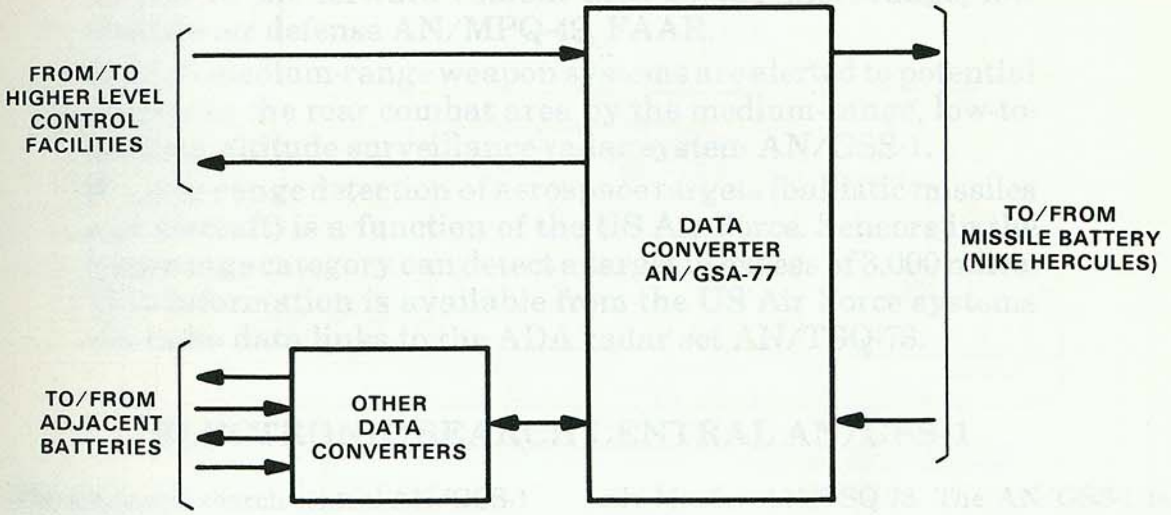
SYSTEM OPERATION

The data converter receives information from higher level control facilities (AN/TSQ-73) over automatic data link in coded digital form. The data converter decodes the incoming digital data and changes it to a form that can be displayed as symbology on the battery consoles. The data converter also receives information from the battery, converts this information into digital data and transmits the data to higher level control facilities for distribution to adjacent batteries and higher echelons.

DATA CONVERTER SYSTEM CHARACTERISTICS

General Characteristics	Power: 120 volts	400 Hz single phase	178 watts
	Digital transfer rate (input/output):	750 bits per second	digital word length: 59 bits.
	Equipment weight:	(135 lbs)	61.2 kg
	Equipment dimensions:		
	Length	(30 in)	76 cm
	Height	(21.1 in)	54 cm
	Depth	(11.75 in)	30 cm
	Displacement	3.7 cu ft	

DATA CONVERTER SYSTEM DATA FLOW


FROM/TO HIGHER LEVEL CONTROL FACILITIES
DATA CONVERTER AN/GSA-77
TO/FROM MISSILE BATTERY (NIKE HERCULES)
TO/FROM ADJACENT BATTERIES
OTHER DATA CONVERTERS

Note: Command and control of short-range air defense weapons is currently accomplished via voice tell over FM radios, using manual procedures. The SHORAD C^2 system is further defined in chapter 5.

CHAPTER 4

ADA Radar Warning Systems

Air defense radars employ radio frequency radiations to detect the presence of aerial targets. ADA units employ short-, medium-, and long-range radars to search an assigned area and report information to an evaluation center. ADA radars provide target identification and position data to ADA weapon and command and control facilities. Principal ADA radars and their uses are as follows:

- **ADA short-range weapon systems are alerted to potential targets in the forward combat area by the short-range, low altitude air defense AN/MPQ-49, FAAR.**
- **ADA medium-range weapon systems are alerted to potential targets in the rear combat area by the medium-range, low-to-medium-altitude surveillance radar system AN/GSS-1.**
- **Long-range detection of aerospace targets (ballistic missiles and aircraft) is a function of the US Air Force. Sensors in the long-range category can detect a target in excess of 3,000 miles. This information is available from the US Air Force systems via radio data links to the ADA radar set AN/TSQ-73.**

ELECTRONIC SEARCH CENTRAL AN/GSS-1

The electronic search central AN/GSS-1 is a medium-range, transportable radar set designed for use as a search radar. The electronic search central was first fielded in the mid-50s and there are no firm plans for modifying or replacing this system at the present time.

SYSTEM DESCRIPTION

The electronic search central consists of a radar set AN/TPS-1G, IFF equipment, and a manual plotting board. All this equipment is contained in a truck-mounted metal shelter. The system is connected by electrical cables (via the radar junction box) to the Missile Minder AN/TSQ-73. The AN/GSS-1 is operated by a four-man crew. The radar system provides real-time azimuth and range position data of aerial targets to the AN/TSQ-73, which relays these data over radio communications links to Hawk fire units.

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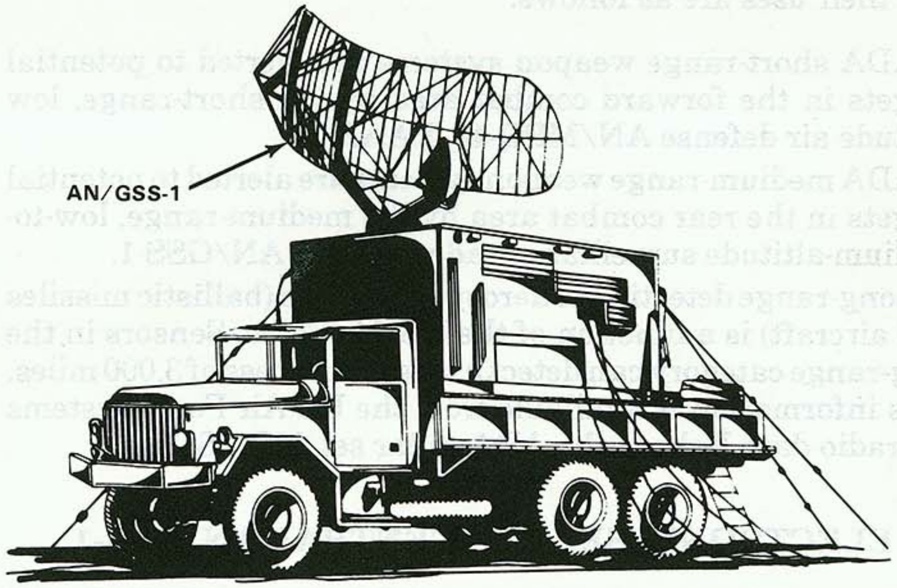
ELECTRONIC SEARCH CENTRAL AN/GSS-1	4-1
FORWARD AREA ALERTING RADAR AN/MPQ-49	4-2
TARGET ALERT DISPLAY	4-4

SYSTEM OPERATION

As a search radar in an early warning net, the AN/GSS-1 will search in an assigned area and report information to an evaluation center. The radar will detect targets and provide target position data to a fire distribution system or an Army air defense command post. The AN/GSS-1 provides target identification when in autonomous operation or when directed by higher headquarters. This set may also be employed in an emergency as an alternate Army air defense command post when collocated with either a manual or automatic fire distribution capability.

ELECTRONIC SEARCH CENTRAL AN/GSS-1



FORWARD AREA ALERTING RADAR AN/MPQ-49

The forward area alerting radar system provides organic early warning sensors to divisional and nondivisional SHORAD units and to separate brigade and armored cavalry regiment SHORAD units when augmented.

SYSTEM DESCRIPTION

The FAAR system is a complete, self-contained alerting radar system. It is lightweight, mobile, and capable of being deployed under the same climatic and terrain conditions as the Chaparral, Vulcan, and Redeye/Stinger systems with which it operates. The system is airportable by cargo aircraft and can be sling-lifted by helicopter. The system is equipped for on-vehicle intercommunications between crew members and tactical voice radio communications. The prime mover is an M561 Gamma Goat which tows the trailer-mounted 5-kilowatt generator for radar power.

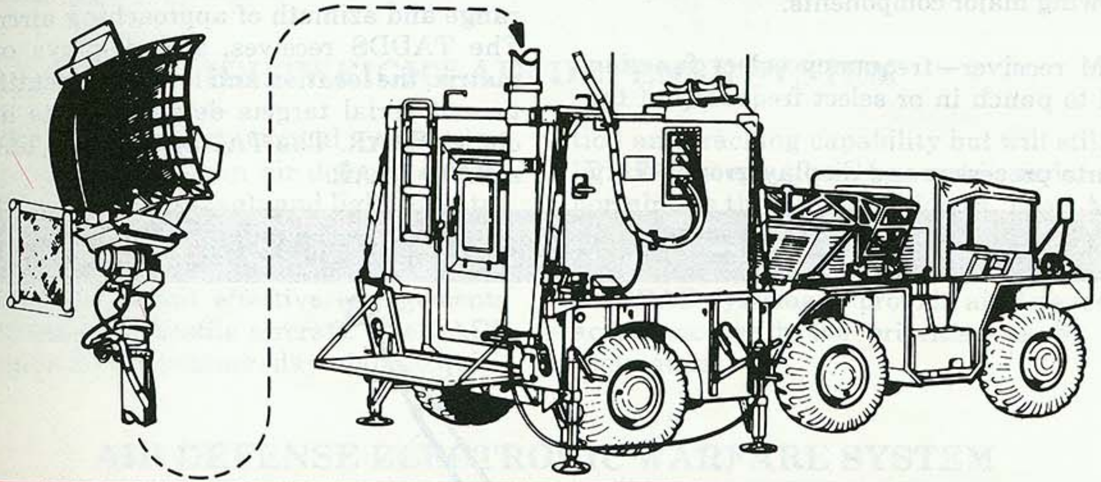
SYSTEM OPERATION

The FAAR system aids in denying enemy aircraft undetected access to forward combat areas. Relative positions in terms of distance and azimuths and tentative identification in terms of friend or unknown are obtained from each target. The FAAR consists of the following major components:

- Radar set AN/TPQ-32.
- Interrogator set AN/TPX-50 (IFF).
- Radio set AN/VRC-46 (track: 1 voice, 1 data).
- Truck M561.
- Generator set 5 kilowatt.
- Trailer M101A2.

The FAAR is manned by a three-man section consisting of a section chief, senior FAAR operator, and FAAR operator.

FORWARD AREA ALERTING RADAR (FAAR)



FAAR SYSTEM CHARACTERISTICS

General Characteristics	Communications	internal/external	through radio set AN/VRC-46
	Emplacement time	20-45 min	
	March order time	20-30 min	
	IFF system	AN/TPX Mark XII	
	Prime mover	1¼-ton, 6 x 6, M561	
	Weight (combat loaded)	(12,000 lbs)	5,433 kg
	Fording depth	(24 inches)	61 cm
	Slope limitations:		
	• Emplacement	10°	
	• Max traverse (curbside):		
	• Downhill	17°	
	• Uphill	21°	

TARGET ALERT DATA DISPLAY SET

The primary mode of operation for the target alert data display set (TADDS) is to receive early warning information from adjacent FAARs and to relay this information by voice to each supported Chaparral, Vulcan, and Redeye/Stinger fire unit.

SYSTEM DESCRIPTION

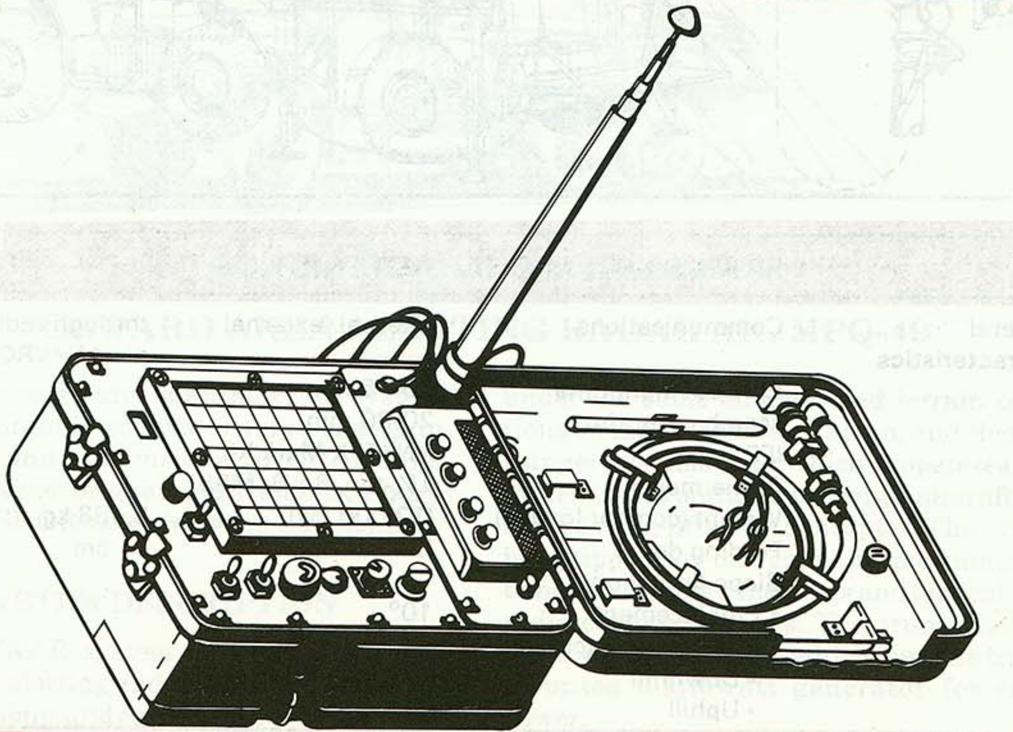
The battery-operated TADDS is a lightweight receiver used by weapon crews to receive target alert information transmitted from a FAAR. The TADDS consists of the following major components:

- FM receiver—frequency select function used to punch in or select frequency of the day.
- Data processor and display group—7 x 7 grid matrix with orange and green disks identifying friend from unknown.
- Battery set—6-volt, nickle cadium battery; 4 hours of operation per charge; requires recharge after 12 hours' use.

SYSTEM OPERATION

In addition to providing alert warning information to Chaparral and Vulcan squads and Stinger/Redeye crews, FAAR/TADDS provide low-altitude air defense weapons with tentative identification and approximate range and azimuth of approaching aircraft. The TADDS receives, and displays on a matrix, the location and tentative identification of aerial targets detected by its associated FAAR. The TADDS requires line of sight to FAAR.

TARGET ALERT DATA DISPLAY SET (TADDS)



CHAPTER 5

ADA Systems of the Future

The Department of Defense research, development, and test program to develop and improve air defense capabilities is an ongoing program. Considerable time and effort are currently being dedicated to the following programs/projects.

LIGHTWEIGHT AIR DEFENSE SYSTEM

The LADS is a conceptual system that will replace the Vulcan air defense system (VADS) in the air assault and light infantry forces. It will have the capability to detect, track, and tentatively identify to a distance sufficient to permit effective engagements out of range of hostile aircraft. The LADS will have an all-weather/day-night acquisition and tracking capability but will still be lightweight enough to be as mobile and transportable as the supported forces. The LADS will be fielded with a force structure similar to that of the Vulcan. It will combine with other SHORAD systems to provide air defense in accordance with the priorities set by the commander.

AIR DEFENSE ELECTRONIC WARFARE SYSTEM

The air defense electronic warfare system (ADEWS) is an electronic warfare countermeasures system designed to degrade the effectiveness of enemy warning receivers and surveillance equipment. Housed in an S-280 shelter, the ADEWS will detect and track airborne units. It can then provide appropriate information to associated air defense units and/or selectively jam the enemy system. The ADEWS is entering advanced development with experimental and operational test hardware to be built and tested.

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AIR DEFENSE ELECTRONIC WARFARE SYSTEM 5-1
DIRECTED ENERGY 5-2
SHORAD C² SYSTEM 5-2
REGIMENTAL AIR DEFENSE ARTILLERY SYSTEM 5-3
ADA SIMULATORS 5-3
ANTITACTICAL MISSILE 5-4

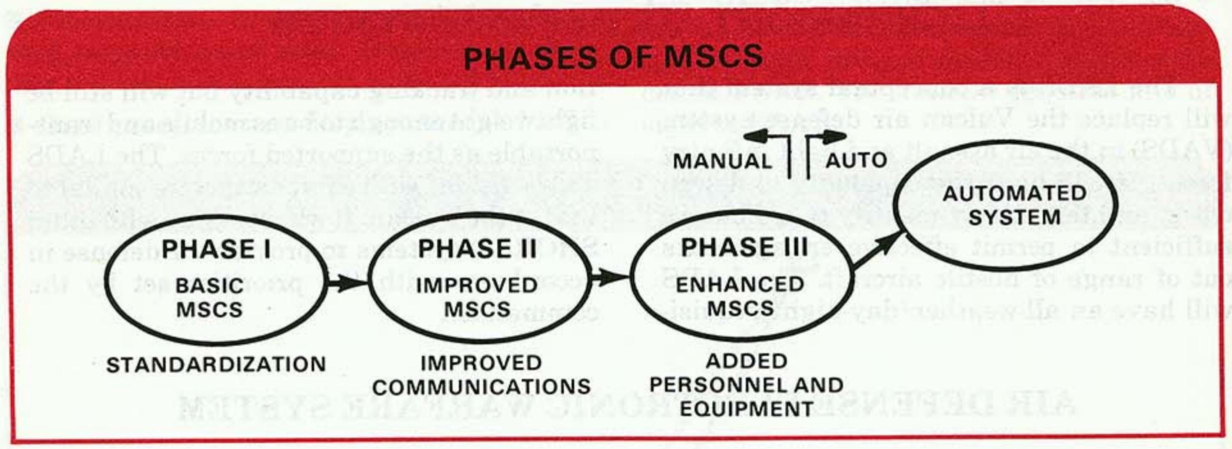
DIRECTED ENERGY

Directed (shielded) energy weapon systems are currently under study at the US Army Air Defense Artillery School (USAADASCH) and within DARCOM. Directed energy has the potential for a quantum increase in weapon system effectiveness in air defense. These weapons are characterized by large magazines of stored engagements, zero-time-of-flight engagement, and the ability to service many different targets rapidly. Directed energy systems include high-energy laser, high-power microwave, and particle beam systems.

SHORAD C^2 SYSTEM

The future SHORAD C^2 system will impose major innovations in collecting and moving data throughout the battlefield. The task will be approached in phases as shown in illustration.

The first three phases address increments of the overall manual SHORAD control system (MSCS).



PHASE I

Phase I, in the initial program, is refered to as the basic MSCS. We are in the basic phase at this time. Standardization of communications systems, aircraft track plotting, aircraft track reports, equipment and personnel in each SHORAD element is in development. This action unifies the AD community and increases a soldier's proficiency by requiring him to learn only one system

PHASE II

Phase II, the improved MSCS, encompasses the addition of improved high-frequency radios (AM) to the SHORAD battalion. These will be used in the early warning broadcast net (EWBN) and command nets to reduce the line of sight and masking problems experienced with FM radios.

PHASE III

Phase III, the final step in the manual system, is the enhanced MCCS. With additional personnel and equipment, we can centralize sensor information such as HIMAD data, airborne early warning information, SHORAD data, and Army aviation information at the battalion air battle management operation center. This newly formed section will disseminate a consolidated air picture to AD elements. However, it will only be through automation that we can achieve the near real-time data flow needed to optimize our air defense weapons. To this end the following requirements have been established to define the system:

- ***Alert SHORAD and maneuver forces of impending attack.*** Alerting requires gross positional data of an aircraft at extended ranges. The data are provided to prepare users for an engagement or defensive action.
- ***Cue SHORAD gunners to aircraft location.*** Cueing requires specific and timely positional data with the tentative identification of the aircraft within a designated range of a fire unit. This information is the basis for an engagement decision.
- ***Rapidly disseminate air defense weapons control information.*** This information, such as weapons control status and rules of engagement passed within real-time parameters, will provide better control of air defense fire units.
- ***Exchange, process, and display information.*** This is a hardware requirement to effectively move data throughout the battlefield to the appropriate users and to present it to them in a manner suitable for their use. This hardware provides the means for data transfer in a timely manner.
- ***Disseminate airspace management information.*** This will allow for a more effective control of air defense weapon systems sharing the airspace with other battlefield elements such as Army Aviation, Air Force, and Field Artillery.
- ***Integrate SHORAD with other major elements on the battlefield.*** This allows the major battlefield elements (air defense, maneuver control, fire support, intelligence/EW, and logistics) to automatically exchange information utilizing their internal data distribution systems.

The SHORAD C^2 system can work as a force multiplier for the limited air defense assets that must meet the future threat. We must consider the advent of new ADA weapon systems that possess extended range and head-on engagement capabilities.

REGIMENTAL AIR DEFENSE ARTILLERY SYSTEM

The regimental air defense artillery system (RADAS) 2000 is a complete system currently under study for a short-range, medium-altitude air defense. The RADAS will be an air defense artillery system designed to operate under the AirLand Battle 2000 Concept.

ADA SIMULATORS

Three simulators to be used as nonsystem training devices for Army air defense training are under development and could be in use in 3 to 5 years. The simulators are as follows:

- The air defense tactical system simulator (ADTSS).
- The air battle management training system (ABMTS).

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ADA BATTALION, HAWK, TOE 44-245

MISSION. To provide continuous air defense of assigned installations or areas against the very low- to medium-altitude hostile aerial targets.

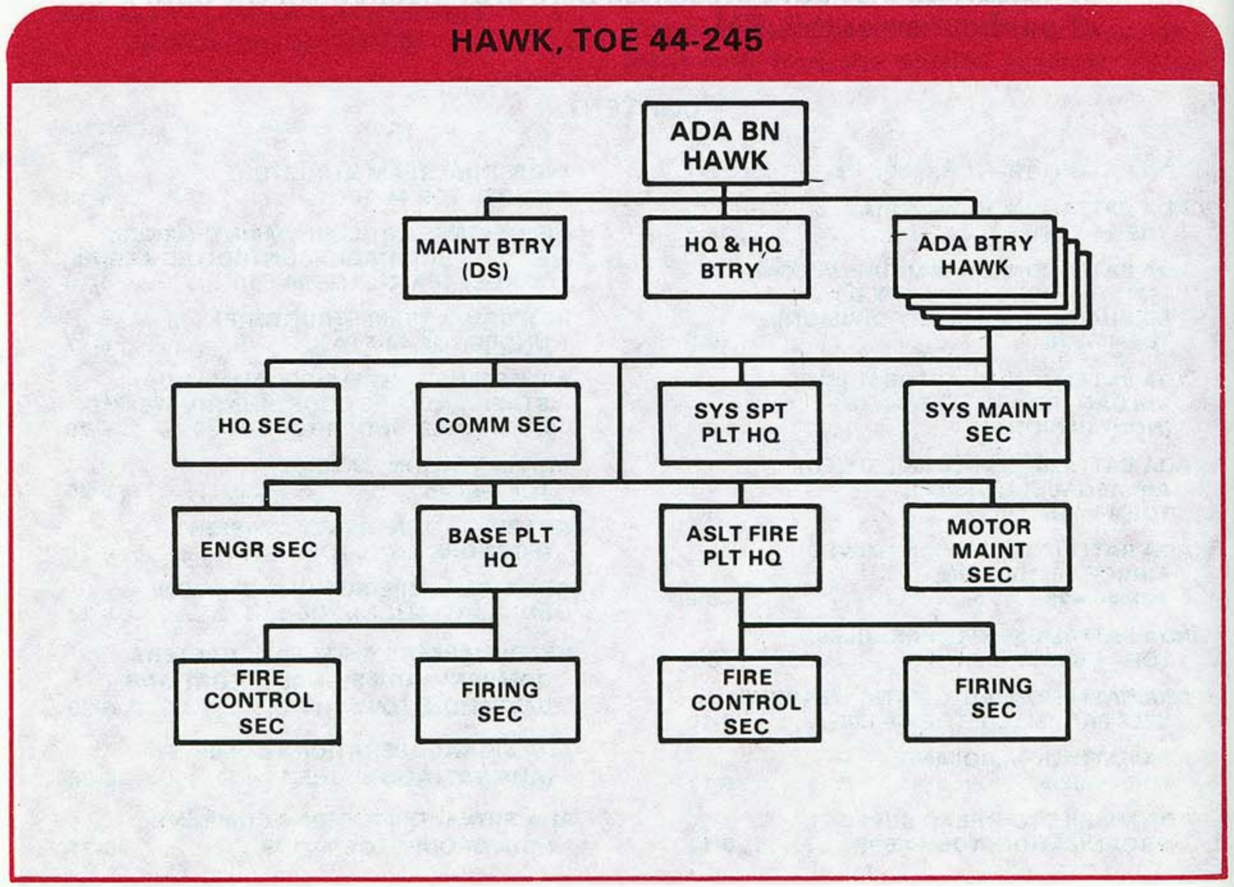
ASSIGNMENT. Normally assigned or attached to an air defense artillery brigade. (May function as a separate battalion.)

CAPABILITIES. Provides air defense of assigned organizations or priority assets against the very-low-to-medium-altitude hostile aerial targets; a command and control system; direct support maintenance of the Hawk missile system; and direct and general support maintenance of the command and control system; and medical service to include operation of the battalion aid station. Provides and operates a battalion fire distribution system, wire and radio communications for the battalion data bank for the fire distribution system, and receives, stores, and issues repair parts required to support the maintenance mission, to include shop operations and battery requirements.

BASIS OF ALLOCATION. One or more per defended asset as required.

MOBILITY. One hundred percent mobile in organic vehicles when organized under mobile TOE. One hundred percent air portable in US Air Force aircraft.

PERSONNEL. Officers 44; warrant officers 19; enlisted 754; total 817.


HAWK, TOE 44-245

ADA BATTALION, HAWK (TRIAD), TOE 44-265

MISSION. To provide continuous air defense of assigned installations or areas against very low-to-medium-altitude hostile aerial targets.

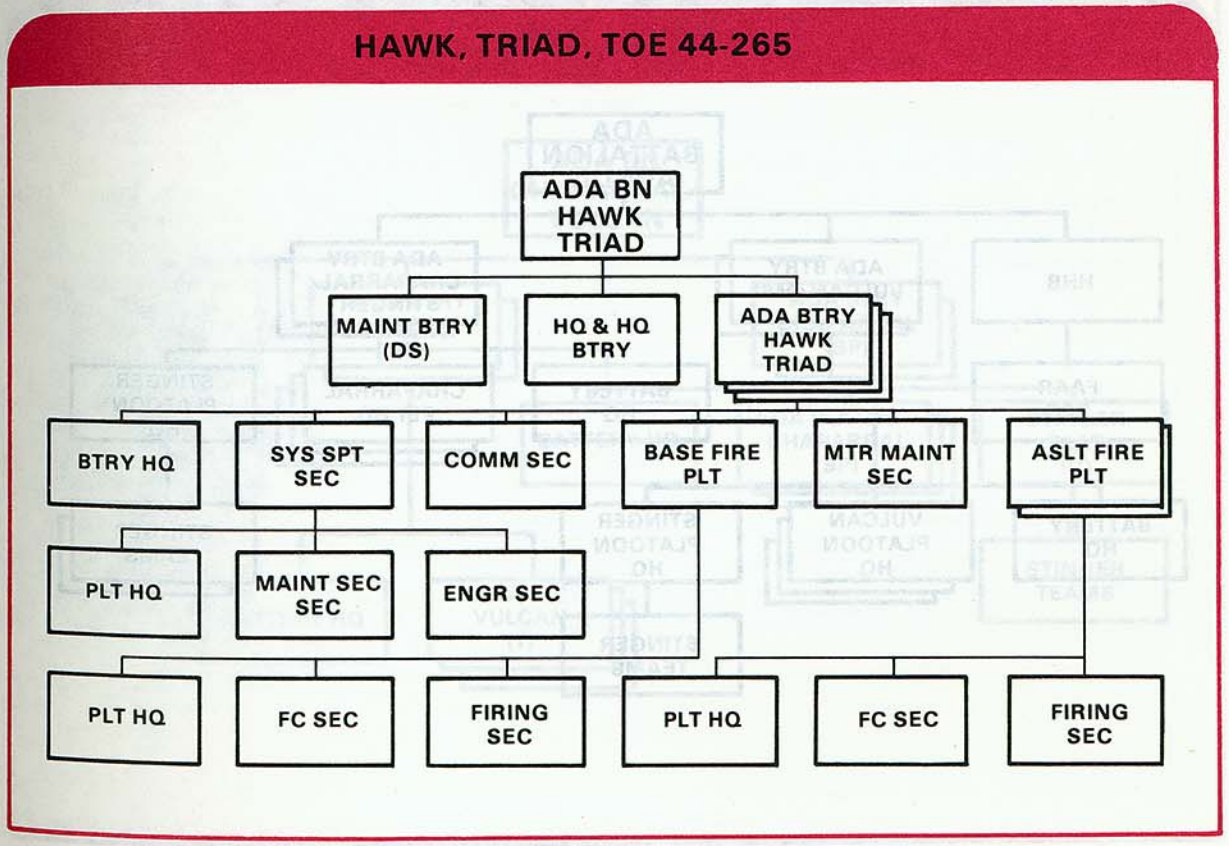
ASSIGNMENT. Normally assigned to an air defense artillery group (may function as a separation battalion).

CAPABILITIES. Provides air defense of organizations or priority assets against low-to-medium-altitude hostile aerial targets; battalion command and control system; wire and radio communications for the battalion automatic data link for the command and control system; direct support maintenance of organic engineer, ordnance, and Hawk-peculiar equipment; and direct and general support maintenance of the command and control system. Receives, stores, and issues repair parts required to support the maintenance mission. Provides medical service to include operation of the battalion aid station. Provides fire support coordination to each divisional brigade and the air defense artillery battalion, and provides air defense personnel and equipment to the division airspace management element (DAME).

BASIS OF ALLOCATION. Normally one per committed division.

MOBILITY. One hundred percent mobile in organic vehicles. One hundred percent air portable in US Air Force aircraft.

PERSONNEL. Officers 44; warrant officers 16; enlisted 711; total 771.


HAWK, TRIAD, TOE 44-265

ADA BATTALION, CHAPARRAL/VULCAN SELF-PROPELLED (ARMORED, INFANTRY, OR MECHANIZED INFANTRY DIVISIONS), TOE 44-325

MISSION. To provide air defense for forward combat elements against low-altitude hostile aircraft and to attack and destroy surface targets as required.

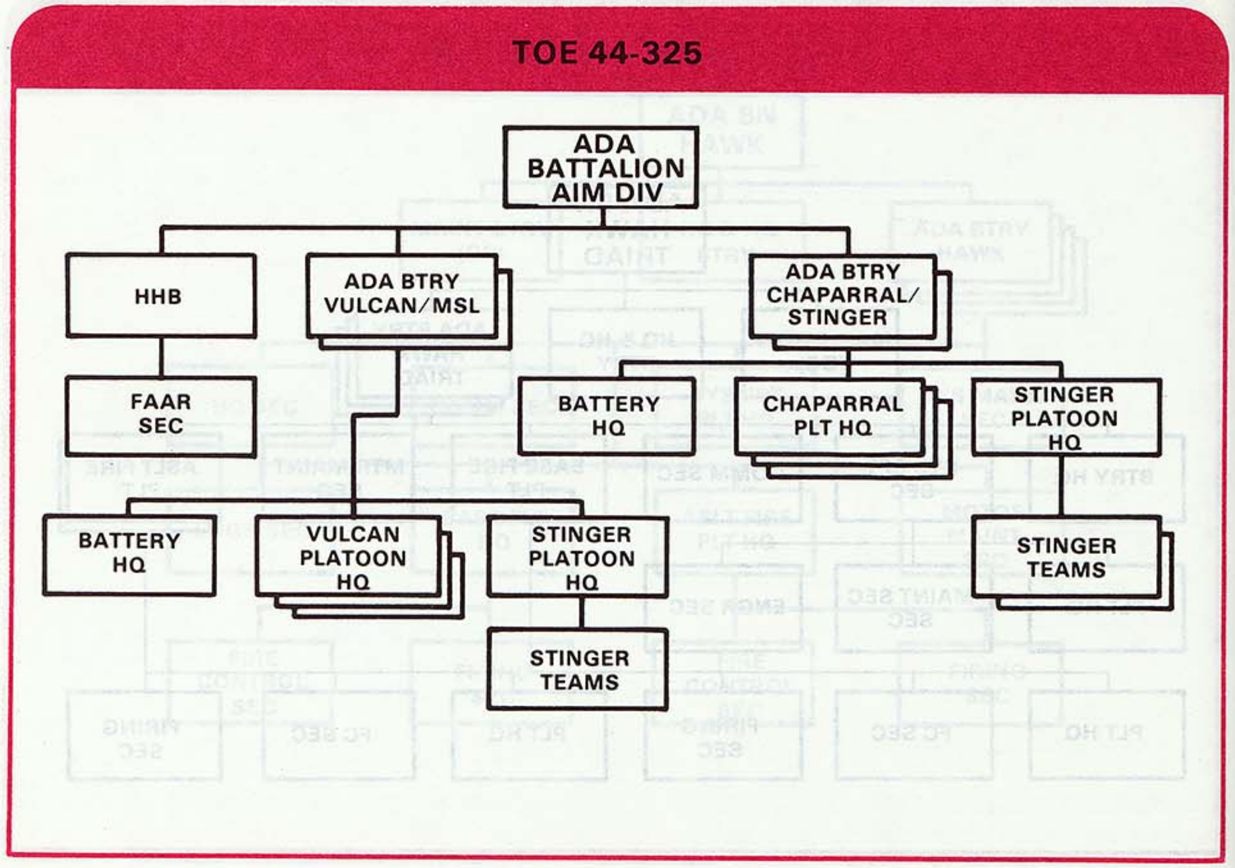
ASSIGNMENT. Organic to armored division, infantry division, and infantry division (mechanized).

CAPABILITIES. Provides air defense against low-altitude hostile aircraft; engagement of surface targets with the Vulcan weapon system when not required in the air defense role; forward area alerting radar capability when so augmented; and medical service to include operation of the battalion aid station. Provides fire support coordination to each divisional brigade and the air defense battalion. Provides air defense personnel and equipment to the division airspace management element (DAME).

BASIS OF ALLOCATION. One per armored division, infantry division, or infantry division (mechanized).

MOBILITY. One hundred percent mobile in organic vehicles.

PERSONNEL. Officers 42, warrant officers 7; enlisted 771; total 820.


TOE 44-325

ADA BATTALION, CHAPARRAL (SELF-PROPELLED), VULCAN (TOWED), TOE 44-725 (NONDIVISIONAL)

MISSION. To provide air defense for corps and theater Army combat elements, areas, or installations against attack by low-altitude hostile aircraft and to attack and destroy surface targets as required.

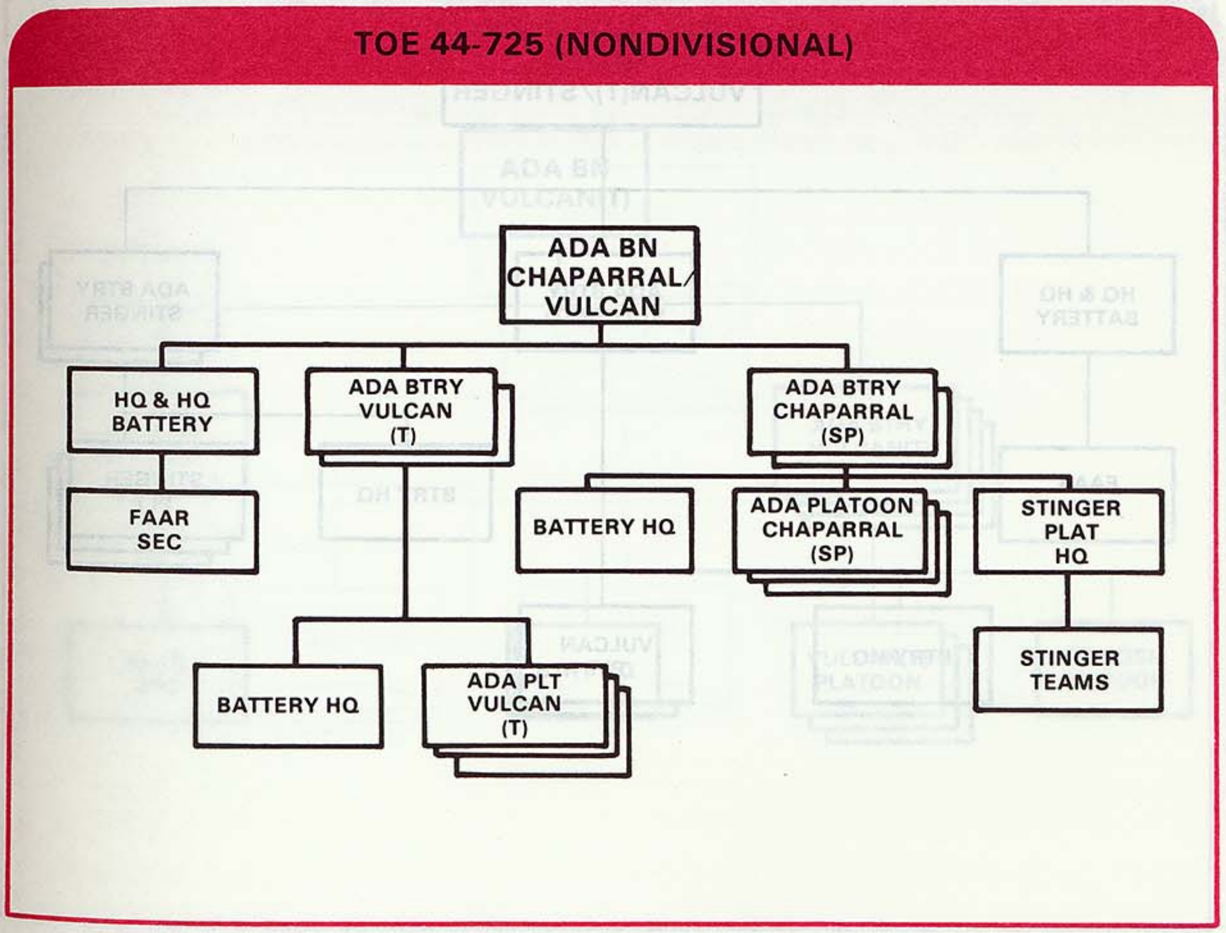
ASSIGNMENT. Normally assigned or attached to an air defense artillery group which supports corps or theater Army.

CAPABILITIES. Provides air defense against low-altitude hostile aircraft. Attacks surface targets with the Vulcan weapon system. Provides forward area alerting radar facility. Provides medical service to include emergency medical treatment, operation of a battalion aid station, and aid men to the firing batteries.

BASIS OF ALLOCATION. To each corps or theater Army as required.

MOBILITY. One hundred percent mobile in organic vehicles. One hundred percent air portable in US Air Force aircraft.

PERSONNEL. Officers 36; warrant officers 7; enlisted 631; total 674.


TOE 44-725 (NONDIVISIONAL)

ADA BATTALION, VULCAN (TOWED), AIR ASSAULT DIVISION, TOE 44-445

MISSION. To provide air defense for the air assault division against attack by low-altitude hostile aircraft, and to attack and destroy hostile surface targets as required.

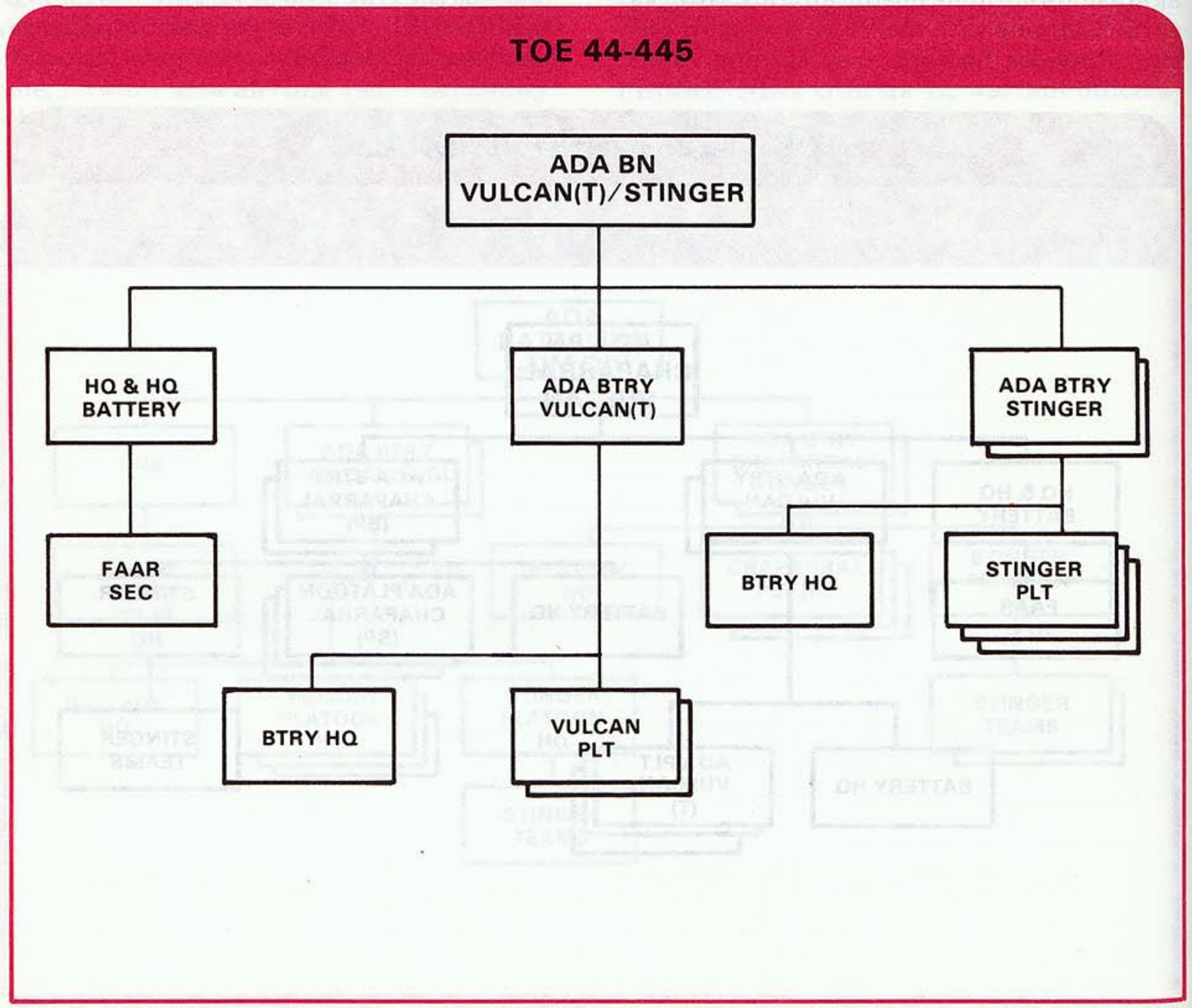
ASSIGNMENT. Organic to the air assault division, TOE 67.

CAPABILITIES. This unit provides air defense against low-altitude hostile aircraft, forward area alerting radar facilities, radio communications with higher, lower, and adjacent units, and the air defense portion of the division airspace management element.

BASIS OF ALLOCATION. One per air assault division.

MOBILITY. Ninety percent mobile in organic vehicles. One hundred percent air portable in US Air Force aircraft.

PERSONNEL. Officers 25; warrant officers 3; enlisted 346; total 374.



ADA BATTALION, VULCAN (TOWED), AIRBORNE DIVISION, TOE 44-425

MISSION. To provide air defense for the airborne division against attack by low-altitude hostile aircraft and to attack and destroy hostile surface targets as required.

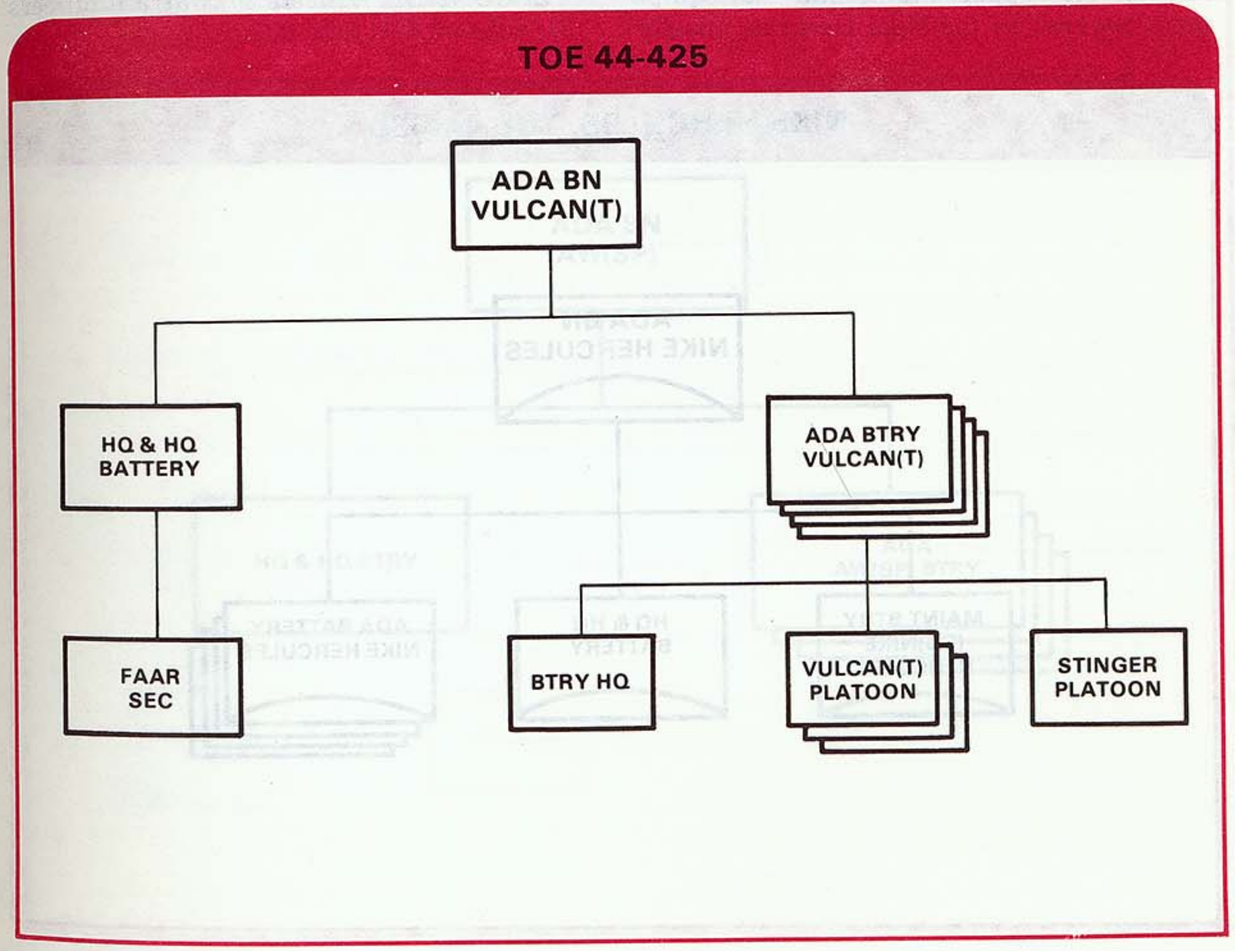
ASSIGNMENT. Organic to airborne division.

CAPABILITIES. Provides air defense against low-altitude hostile aircraft attacks or defense against surface targets; provides forward area alerting radar facility; provides unit level medical support to the battalion; establishes an aid station and furnishes battery aid men; performs landing by parachute and aircraft; provides fire support coordination to each divisional brigade and the air defense battalion, Hawk, supporting the division; provides air defense personnel and equipment to assist the overall coordination, integration and regulation of the use of airspace over division area of operations.

BASIS OF ALLOCATION. One per airborne division.

MOBILITY. Eighty percent mobile in organic vehicles. One hundred percent air portable in US Air Force aircraft.

PERSONNEL. Officers 42; warrant officers 7; enlisted 693, total 742.



ADA BATTALION, NIKE HERCULES, TOE 44-535

MISSION. To provide air defense of assigned organizations or critical assets against medium- and high-altitude hostile aerial targets, and to provide guided missile fires on designated surface targets.

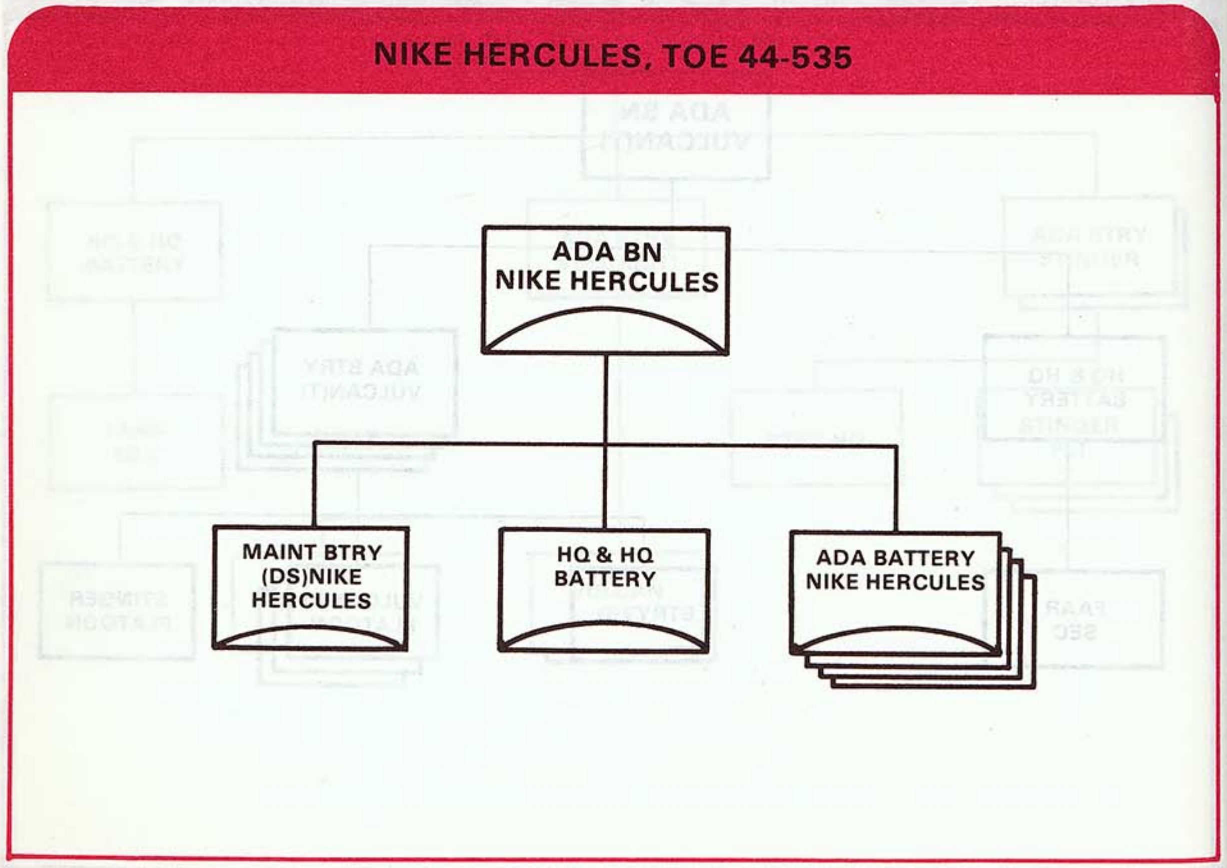
ASSIGNMENT. Normally assigned or attached to an air defense artillery brigade in support of a corps, theater Army, or may function as a separate battalion.

CAPABILITIES. Provides air defense of organizations or priority assets against medium- and high-altitude hostile targets. Provides fires against selected surface targets and directs support maintenance of equipment peculiar to the Nike Hercules missile system. Provides direct and general support maintenance for the command and control system and medical service to include operation of battalion aid station. Receives, stores, and issues repair parts required to support the maintenance mission. Provides a trained security force for the missile storage areas in the firing batteries.

BASIS OF ALLOCATION. One or more per defended asset as required.

MOBILITY. Forty percent mobile in organic vehicles. One hundred percent air portable in US Air Force aircraft.

PERSONNEL. Officers 34; warrant officers 21; enlisted 878; total 933.


NIKE HERCULES, TOE 44-535

ADA BATTALION, AUTOMATIC WEAPONS, SELF-PROPELLED, TOE 44-085

MISSION. To provide air defense for forward combat elements against attack by low-altitude hostile aircraft and to attack and destroy surface targets as required.

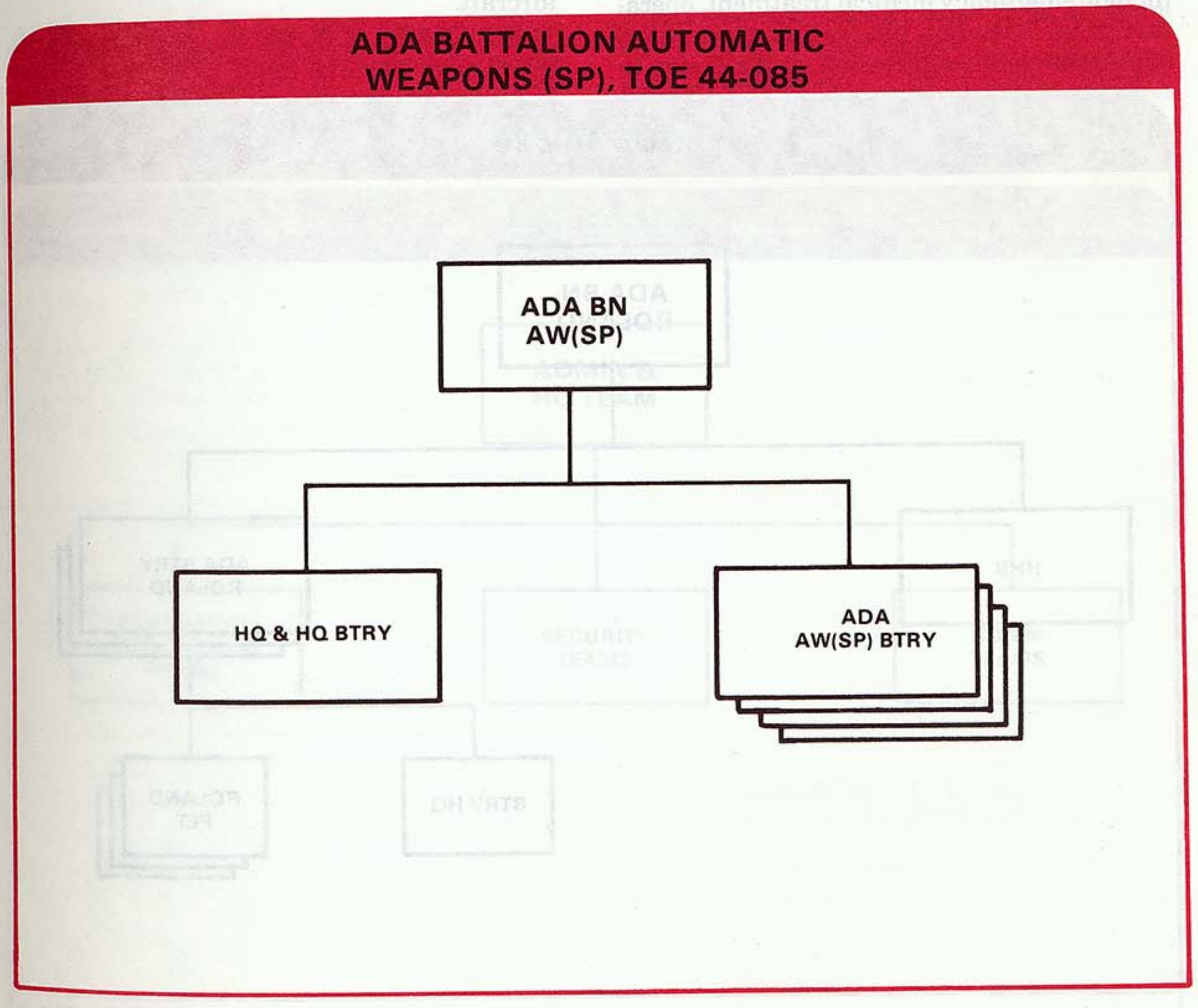
ASSIGNMENT. Normally assigned to a division for deployment as required.

CAPABILITIES. Provides air defense against low-altitude hostile aircraft, a weapon system for engagement of surface targets when not required in the air defense role; wire and radio communications for the battalion, to include an early warning system; unit medical support; operation of the battalion aid station and the evacuation of casualties.

BASIS OF ALLOCATION. One or more to division or corps as required to insure availability of one battalion per committed division.

MOBILITY. One hundred-percent mobile.

PERSONNEL. Officers 35; warrant officers 3; enlisted 692; total 730.


ADA BATTALION AUTOMATIC WEAPONS (SP), TOE 44-085

ADA BATTALION, ROLAND, TOE 44-625

MISSION. To provide short-range, all-weather air defense for ground combat forces and high-value assets against low-altitude hostile aircraft.

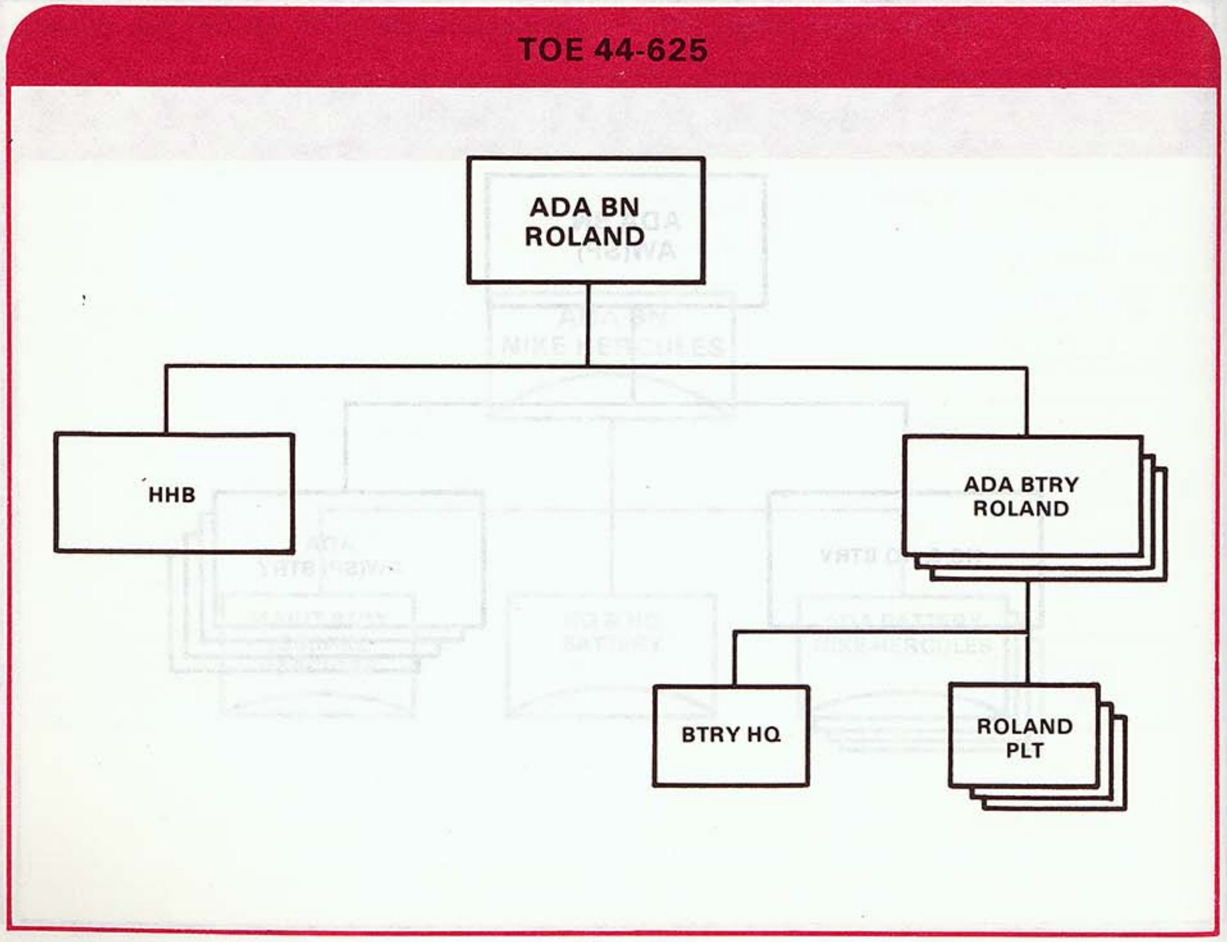
ASSIGNMENT. Normally assigned or attached to an air defense artillery brigade which supports the contingency corps and may function as a separate battalion.

CAPABILITIES. Provides short-range, all-weather air defense against low-altitude hostile aircraft and unit level medical support, to include emergency medical treatment, operation of the battalion aid station, evacuation of patients to the aid station, and aid men to the subordinate batteries. Provides air defense coordination to the air defense artillery brigade, battalion and/or other supported assets; and limited transportation of the ammunition basic load for Roland fire units in the battalion.

BASIS OF ALLOCATION. One per contingency corps, rapid deployment joint task force, Army.

MOBILITY. Ninety-five percent mobile in organic vehicles. One hundred percent air portable in US Air Force C-141 and C-5A aircraft.

PERSONNEL. Officers 31; warrant officers 8; enlisted 355; total 394.



ADA MISSILE WARHEAD SUPPORT ORGANIZATION, TOE 44-500

MISSION. To provide by team composition for the custody, control, storage, organizational maintenance support, and monitoring of nuclear warhead sections and components (or nonnuclear components) in support of a Nike Hercules unit of an allied nation. To perform nuclear warhead section/missile mating installations or operations by team composition, depending upon tactical and logistical considerations. TOE does not contain an organizational chart. Teams are selected to perform directed missions.

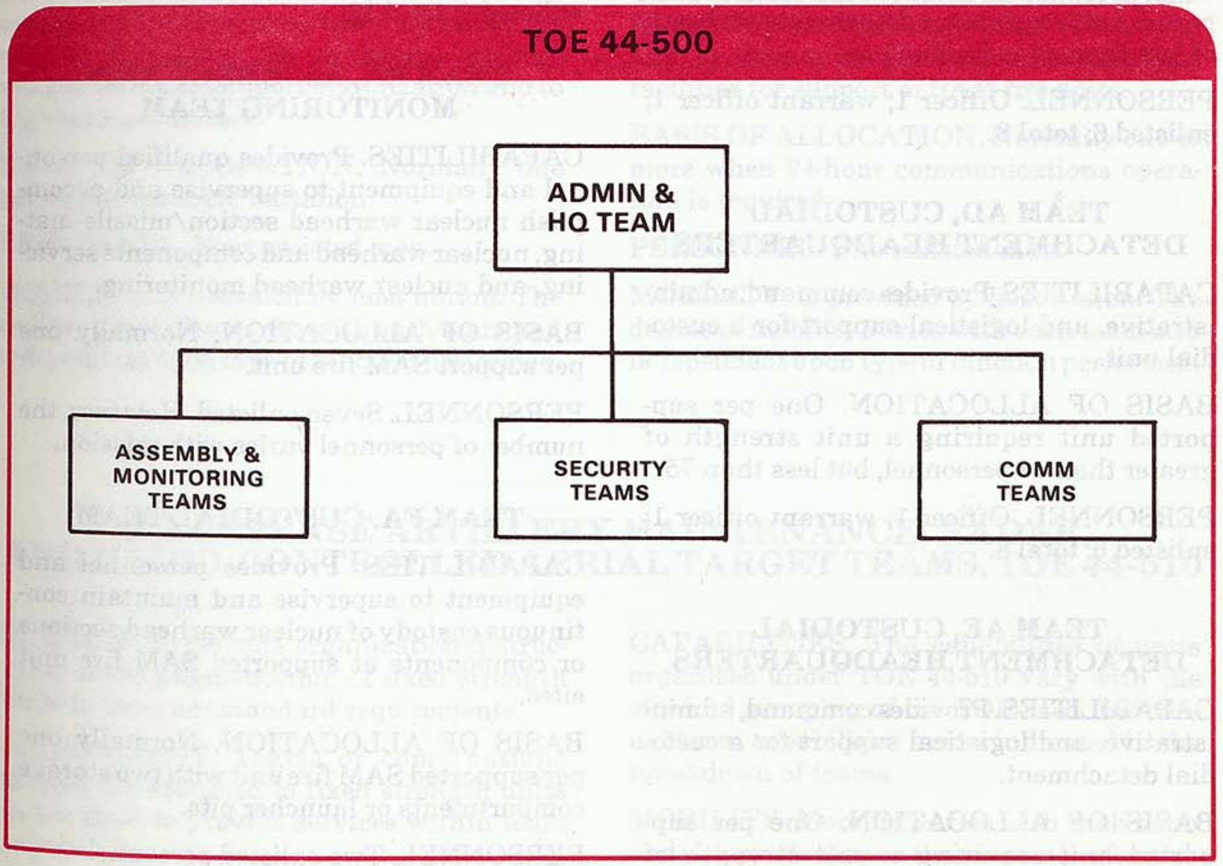
ASSIGNMENT. Teams may be attached or assigned as required to fixed strength units or may be organized into support units to perform custodial and monitoring functions under varying conditions.

CAPABILITIES. The capabilities of units organized under this table vary with the size and grouping of teams used.

BASIS OF ALLOCATION. Normally one detachment, with appropriate teams per supported surface-to-air missile battalion (equivalent to an ADA missile battalion, Nike Hercules).

MOBILITY. Mobility capability is provided by host nation. The degree of mobility varies with each team and is dependent upon the type of function performed.

PERSONNEL. Varies according to mission needs.



INDIVIDUAL TEAM STRUCTURE UNDER TOE 44-500

TEAM AB, CUSTODIAL TEAM HEADQUARTERS

CAPABILITIES. Provides command and administrative support for a custodial team.

BASIS OF ALLOCATION. One per Nike Hercules fire unit subordinate to an organization supported by team AC, AD, AE, or AF.

PERSONNEL. Officers 3; enlisted 5; total 8.

TEAM AC, CUSTODIAL DETACHMENT HEADQUARTERS

CAPABILITIES. Provides command, administrative, and logistical support for a custodial detachment.

BASIS OF ALLOCATION. One per supported unit requiring a detachment strength of less than 44 individuals.

PERSONNEL. Officer 1; warrant officer 1; enlisted 6; total 8.

TEAM AD, CUSTODIAL DETACHMENT HEADQUARTERS

CAPABILITIES. Provides command, administrative, and logistical support for a custodial unit.

BASIS OF ALLOCATION. One per supported unit requiring a unit strength of greater than 44 personnel, but less than 75.

PERSONNEL. Officer 1; warrant officer 1; enlisted 6; total 8.

TEAM AE, CUSTODIAL DETACHMENT HEADQUARTERS

CAPABILITIES. Provides command, administrative, and logistical support for a custodial detachment.

BASIS OF ALLOCATION. One per supported unit requiring a unit strength of greater than 75 individuals.

PERSONNEL. Officer 2; warrant officer 1; enlisted 9; total 12.

TEAM AF, CUSTODIAL DETACHMENT HEADQUARTERS

CAPABILITIES. Provides command, administrative, and logistical support for a custodial unit.

BASIS OF ALLOCATION. Required where the unit commander is also the post commander.

PERSONNEL. Officer 2; warrant officer 1; enlisted 9; total 12.

TEAM EA, ASSEMBLY AND MONITORING TEAM

CAPABILITIES. Provides qualified personnel and equipment to supervise and accomplish nuclear warhead section/missile mating, nuclear warhead and components servicing, and nuclear warhead monitoring.

BASIS OF ALLOCATION. Normally one per support SAM fire unit.

PERSONNEL. Seven enlisted. However, the number of personnel varies with mission.

TEAM FA, CUSTODIAL TEAM

CAPABILITIES. Provides personnel and equipment to supervise and maintain continuous custody of nuclear warhead sections or components at supported SAM fire unit sites.

BASIS OF ALLOCATION. Normally one per supported SAM fire unit with two storage compartments or launcher pits.

PERSONNEL. Two enlisted personnel.

TEAM FB, CUSTODIAL TEAM

CAPABILITIES. Provides personnel and equipment to augment the FA when more than two storage compartments are used.

BASIS OF ALLOCATION. Normally one per additional storage compartment or launcher pit.

PERSONNEL. Eight enlisted men.

MOBILITY. Is provided by host nation. The degree of mobility varies with each team and is dependent upon type of function performed.

TEAM GA, COMMUNICATIONS TEAM

CAPABILITIES Provides personnel and equipment for the operation and maintenance of radio nets within the air defense artillery missile warhead support organization and to higher headquarters.

BASIS OF ALLOCATION. Normally one per supported SAM battalion.

PERSONNEL. Four enlisted men.

MOBILITY. Is provided by host nation. The degree of mobility varies with each team and is dependent upon type of function performed.

TEAM GB, COMMUNICATIONS TEAM

CAPABILITIES. Provides personnel to reinforce the operational capabilities of team GA as required.

BASIS OF ALLOCATION. Normally one or more when 24-hour radio operation requires augmentation.

PERSONNEL. One enlisted man.

MOBILITY. Is provided by host nation. The degree of mobility varies with each team and is dependent upon type of function performed.

TEAM GC, COMMUNICATIONS TEAM

CAPABILITIES. Provides personnel to reinforce the operational capabilities of team GA and/or operate, as required, radio/telephone facilities for support of SAM fire units.

BASIS OF ALLOCATION. Normally one or more when 24-hour communications operation is required.

PERSONNEL. One enlisted man.

MOBILITY. Is provided by host nation. The degree of mobility varies with each team and is dependent upon type of function performed.

AIR DEFENSE ARTILLERY MAINTENANCE, RADAR, AND RADIO-CONTROLLED AERIAL TARGET TEAMS, TOE 44-510

MISSION. To provide organizational structures of the augmentation of fixed strength units to meet nonstandard requirements.

ASSIGNMENT. Teams or combinations thereof are assigned to fixed strength units as required to provide services within team capabilities.

CAPABILITIES. The capabilities of units organized under TOE 44-510 vary with the size and grouping of the TOE used. Individual team capabilities are as indicated in the breakdown of teams.

MOBILITY. Mobility varies with each team and is dependent upon the mission performed.

INDIVIDUAL TEAM STRUCTURE UNDER TOE 44-510

TEAM BA, HAWK DS MAINTENANCE AND SUPPLY TEAM

CAPABILITIES. Provides limited on-site direct support maintenance and supply for up to two Hawk batteries.

BASIS OF ALLOCATION. One per up to two Hawk batteries which are deployed away from the parent headquarters and support from that headquarters is not available.

PERSONNEL. Varies with mission.

MOBILITY. One hundred percent mobile in organic vehicles.

TEAM EA, HAWK MAINTENANCE SECTION

CAPABILITIES. Performs organizational maintenance and provides mobility for a battalion set of Hawk float equipment. Provides wheel vehicle mechanics to augment the motor maintenance section of the battalion to which attached.

BASIS OF ALLOCATION. One per Hawk battalion (square or triad) when required to support a battalion set of float equipment.

PERSONNEL. Varies with mission.

MOBILITY. One hundred percent mobile in organic vehicles.

TEAM EB, FIRE DISTRIBUTION SYSTEM DS MAINTENANCE TEAM

CAPABILITIES. Provides direct support maintenance for up to one operations central, one defense acquisition radar, and two data converters.

BASIS OF ALLOCATION. As required to support two air defense artillery batteries and one TOC in independent operations.

PERSONNEL. Varies with mission.

MOBILITY. One hundred percent mobile in organic vehicles.

TEAM FA, RADAR SECTION, AN/GSS-7

CAPABILITIES. Operates and performs organizational maintenance on one radar set, AN/GSS-7, and associated equipment and operates the NCS for the IRR net.

BASIS OF ALLOCATION. One per Army Air Defense Command Post if no other radar is available.

PERSONNEL. Varies with mission.

MOBILITY. One hundred percent mobile in organic vehicles.

TEAM FB, FORWARD AREA ALERTING RADAR SECTION

CAPABILITIES. Operates and performs organization maintenance on three forward area alerting radars and associated equipment.

BASIS OF ALLOCATION. One per separate brigade/armored cavalry regiment (ACR).

PERSONNEL. Varies with mission.

MOBILITY. One hundred percent mobile in organic vehicles.

TEAM FC, HIPAR SECTION

CAPABILITIES. Operates and performs organizational maintenance on the mobile HIPAR and associated equipment.

BASIS OF ALLOCATION. One per Nike Hercules battery when authorized HIPAR.

PERSONNEL. Varies with mission.

MOBILITY. All equipment with the exception of the HIPAR is transportable with organic assets.

TEAM FD, HIPAR SUPPORT SECTION

CAPABILITIES. Provides personnel and equipment for direct support maintenance of from one to four HIPAR. Team augments the ground guidance equipment support section and the technical supply function of the support battery of a Nike Hercules battalion.

BASIS OF ALLOCATION. One for Nike Hercules battalion when authorized HIPAR.

PERSONNEL. Varies with mission.

MOBILITY. Eighty-five percent mobile in organic vehicles.

TEAM FE, HIPAR TRANSPORT SECTION

CAPABILITIES. Operates and performs organizational maintenance on vehicles used to transport one HIPAR section, TOE 44-537 or team FC. Augments the transportation and motor maintenance sections of the Nike Hercules headquarters battery.

BASIS OF ALLOCATION. One per Nike Hercules battalion when authorized HIPAR.

PERSONNEL. Varies with mission.

MOBILITY. One hundred percent mobile in organic vehicles.

TEAM IA, RADIO-CONTROLLED AERIAL TARGET (RCAT) HEADQUARTERS SECTION

CAPABILITIES. Provides personnel and equipment for the command, operations, planning and logistical support of one to three RCAT flight sections.

BASIS OF ALLOCATION. One or more teams per RCAT section and ADA headquarters as required to support training operations.

MOBILITY. One hundred percent mobile in organic vehicles.

TEAM IB, RCAT, FLIGHT SECTION

CAPABILITIES. Prepares and launches low-speed aerial targets for target practice by ADA units.

BASIS OF ALLOCATION. One to three per RCAT headquarters sections, team IA, as required.

MOBILITY. One hundred percent mobile in organic vehicles.

TEAM IC, RCAT SUPPORT SECTION

CAPABILITIES. Provides organizational maintenance support for the RCAT flight section targets.

BASIS OF ALLOCATION. One per RCAT flight section, team IB.

PERSONNEL. Varies with mission.

MOBILITY. One hundred percent mobile in organic vehicles.

AIR DEFENSE ARTILLERY COMMAND, STAFF, AND FIRE COORDINATION TEAMS ORGANIZED UNDER TOE 44-520

MISSION. To provide organizational structures for the augmentation of fixed strength units to meet nonstandard requirements.

ASSIGNMENT. Teams or combinations thereof are assigned to fixed strength units as required to provide services within team capabilities.

CAPABILITIES. The capabilities of units organized under this TOE vary with the size and grouping of TOE used. Individual team capabilities are indicated under Breakdown of Teams.

BASIS OF ALLOCATION. Indicated under Breakdown of Teams.

PERSONNEL. Varies with mission.

MOBILITY. Indicated under Breakdown of Teams.

INDIVIDUAL TEAM STRUCTURE UNDER TOE 44-520

TEAM AA, COMMAND AND ADMINISTRATIVE TEAM

CAPABILITIES. Provides limited command, administrative and personnel support for two Hawk batteries during short-term contingency missions.

BASIS OF ALLOCATION. One per two Hawk batteries.

MOBILITY. One hundred percent mobile in organic vehicles.

TEAM FA, CHAPARRAL/VULCAN MAINTENANCE STAFF TEAM

CAPABILITIES. Provides technical expertise to the commander and staff on C/V maintenance and operations related matters. Conducts technical evaluations and inspections of C/V fire units.

BASIS OF ALLOCATION. One per ADA group or brigade headquarters as required.

PERSONNEL. Varies with mission.

MOBILITY. This unit is dependent upon the unit to which assigned or attached for transport.

TEAM FB, HAWK MAINTENANCE STAFF TEAM

CAPABILITIES. Provides technical expertise to the commander and staff on Hawk maintenance and operations related matters. Conducts technical evaluations and inspections of Hawk units.

BASIS OF ALLOCATION. One per ADA command, brigade, or group headquarters, as required.

PERSONNEL. Varies with mission.

MOBILITY. This unit is dependent upon the unit to which assigned or attached for transport.

TEAM FC, HERCULES MAINTENANCE STAFF TEAM

CAPABILITIES. Provides technical expertise to the command and staff on Nike Hercules maintenance and operations related matters. Conducts technical evaluations and inspections of Nike Hercules units.

BASIS OF ALLOCATION. One per ADA command, brigade, or group headquarters, as required.

PERSONNEL. Varies with mission.

MOBILITY. This unit is dependent upon the unit to which assigned or attached for transport.

TEAM FD, DIRECT SUPPORT MAINTENANCE STAFF TEAM

CAPABILITIES. Provides technical expertise to the commander and staff on matters pertaining to direct support maintenance.

BASIS OF ALLOCATION. One per ADA command, brigade, or group headquarters, as required.

PERSONNEL. Varies with mission.

MOBILITY. This unit is dependent upon the unit to which assigned or attached for transport.

TEAM FE, OPERATIONS/ INTELLIGENCE STAFF TEAM

CAPABILITIES. Provides coordination of operations and intelligence functions for two Hawk batteries during short-term contingency missions.

BASIS OF ALLOCATIONS. One per two Hawk batteries.

PERSONNEL. Varies with mission.

MOBILITY. One hundred percent mobile in organic vehicles.

TEAM GA, LIAISON SECTION, SMALL HEADQUARTERS

CAPABILITIES. Provides liaison from an ADA unit to a brigade or smaller headquarters for the purpose of airspace management, fire coordination, or similar liaison functions.

BASIS OF ALLOCATION. As required, based on above capabilities.

PERSONNEL. Varies with mission.

MOBILITY. One hundred percent mobile in organic vehicles.

TEAM GB, LIAISON SECTION, LARGE HEADQUARTERS

CAPABILITIES. Provides liaison from an ADA unit to a headquarters equivalent to a division or larger, to include combined headquarters for airspace management fire coordination or similar liaison functions.

BASIS OF ALLOCATION. As required, based on above capabilities.

PERSONNEL. Varies with mission.

MOBILITY. One hundred percent mobile in organic vehicles.

TEAM GC, ADA ELEMENT, CORPS AIRSPACE MANAGEMENT ELEMENT (CAME)

CAPABILITIES. Provides expertise and equipment for the interface of ADA units with other units involved in the management of airspace over a corps area.

BASIS OF ALLOCATION. One per ADA brigade or group supporting a corps.

PERSONNEL. Varies with mission.

MOBILITY. One hundred percent in organic vehicles.

TEAM GC, FIRE DISTRIBUTION TEAM, MANUAL AADCP

CAPABILITIES. Provides the personnel and equipment for the operation of a manual AADCP.

BASIS OF ALLOCATION. One per ADA headquarters requiring a manual AADCP as a primary or alternate AADCP (normally restricted to group and/or brigade).

PERSONNEL. Varies with mission.

MOBILITY. This unit is approximately 75 percent mobile in organic vehicles.

TEAM GE, FIRE DISTRIBUTION TEAM, CRC/CRP

CAPABILITIES. Provides the fire coordination interface between the ADA unit and a US Air Force control and reporting center (CRC) or control and reporting post (CRP) or their equivalent. Provides command and administrative support to assigned tactical director teams (team GF).

BASIS OF ALLOCATION. To ADA command, brigade, or group headquarters, required to interface with the US Air Force tactical air control system or its equivalent.

PERSONNEL. Varies with mission.

MOBILITY. One hundred percent mobile in organic vehicles.

TEAM GF, TACTICAL DIRECTOR TEAM, CRC/CRP

CAPABILITIES. Provides automatic data link interface between ADA units and the US Air Force tactical air control system or its equivalent. Operates one console of the US Air Force tactical air control system on a 24-hour basis.

BASIS OF ALLOCATION. One per US Air Force tactical air control system console dedicated to ADA operations.

PERSONNEL. Varies with mission.

MOBILITY. One hundred percent mobile in organic vehicles and US Air Force aircraft.

TEAM GG, FIRE DISTRIBUTION TEAM, AN/TSQ-38

CAPABILITIES. Provides the personnel and equipment for the operation of an AN/TSQ-38 on a 24-hour basis.

BASIS OF ALLOCATION. As required, based on above capabilities.

PERSONNEL. Varies with mission.

MOBILITY. This unit is approximately 95 percent mobile in organic vehicles.

TEAM GH, FIRE DISTRIBUTION TEAM, AN/TSQ-73

CAPABILITIES. Provides the personnel and equipment necessary for 24-hour per day operation of the AN/TSQ-73.

BASIS OF ALLOCATION. As required, based on above capabilities.

PERSONNEL. Varies with mission.

MOBILITY. One hundred percent mobile in organic vehicles.

ADA BATTALION PATRIOT, TOE 44-635

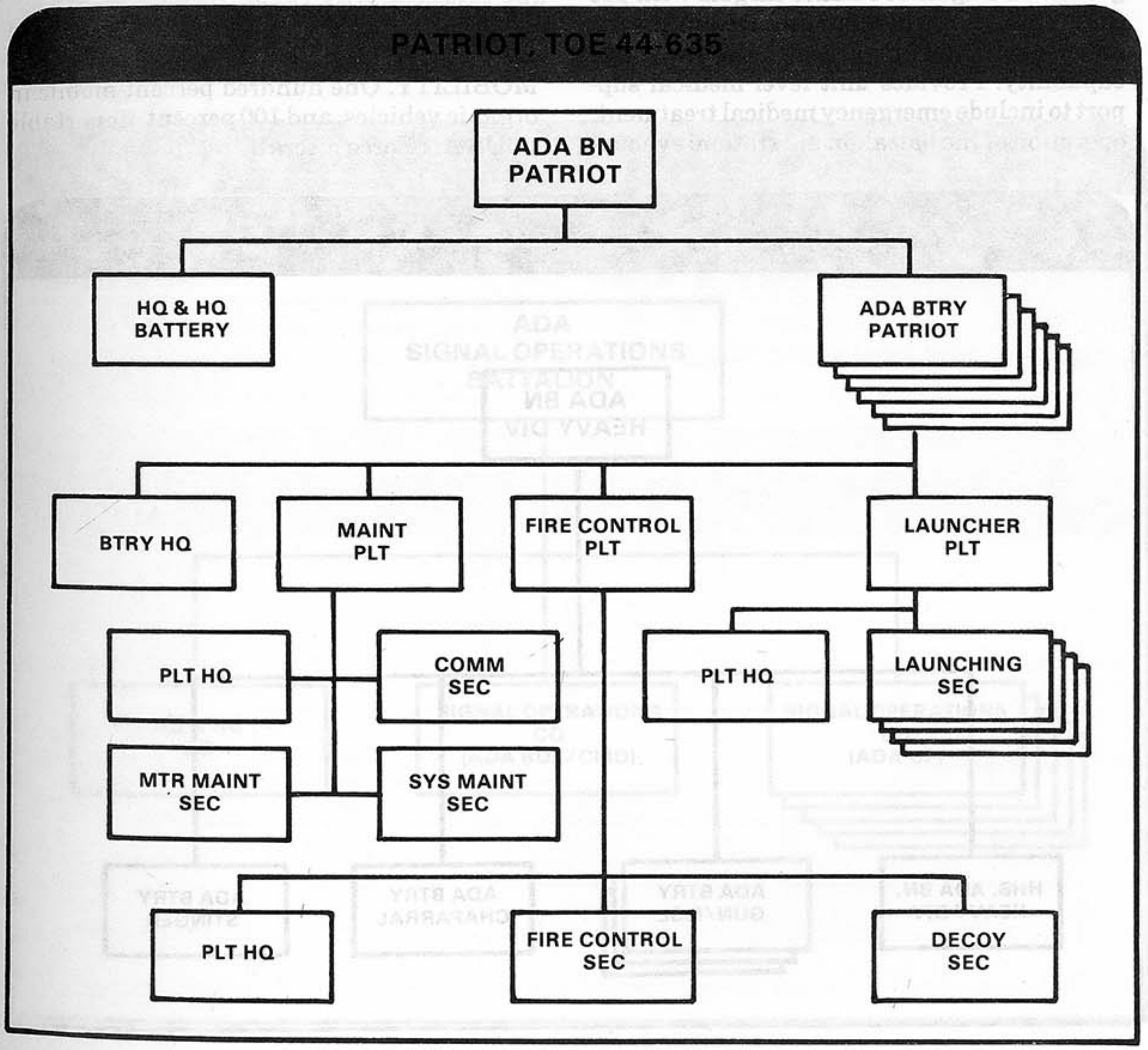
MISSION. To provide very-low-to-very-high-altitude air defense of ground combat forces and high value assets.

ASSIGNMENT. Normally assigned to an air defense artillery brigade at the theater Army level.

CAPABILITIES. This unit provides assets for sustained air defense of ground combat forces and high value assets against very-low-to-very high-altitude hostile aerial targets. Provides radio and wire communications for the battalion, and multichannel communications systems for the battalion command and control system, and operations of a Patriot battalion electronic command and control system. Provides direct support (DS) maintenance of engineer and signal type equipment (less teletypewriter and wire communictions type items). Provides receipt, storage, and issue of spares and repair parts required to support the maintenance mission. This include shop operations, and firing battery requirements. This unit is capable of the operation of a decentralized automated service support system (DAS3) for the technical supply stock control function. Provides unit level medical support including emergency medical treatment, operation of the battalion aid station, and evacuation of patients. Provides aid, men and ambulances to the firing batteries.

PERSONNEL. Officers 48; warrant officers 11; enlisted 817; total 876.

MOBILITY. One hundred percent mobile in organic vehicles.



ADA BATTALION, HEAVY DIVISION (SGT YORK GUN), TOE 44-165

MISSION. To provide air defense against low-altitude hostile aircraft for the armored and mechanized infantry divisions and to provide effective ground fire against surface targets as required.

ASSIGNMENT. Organic to the heavy division, TOE 87.

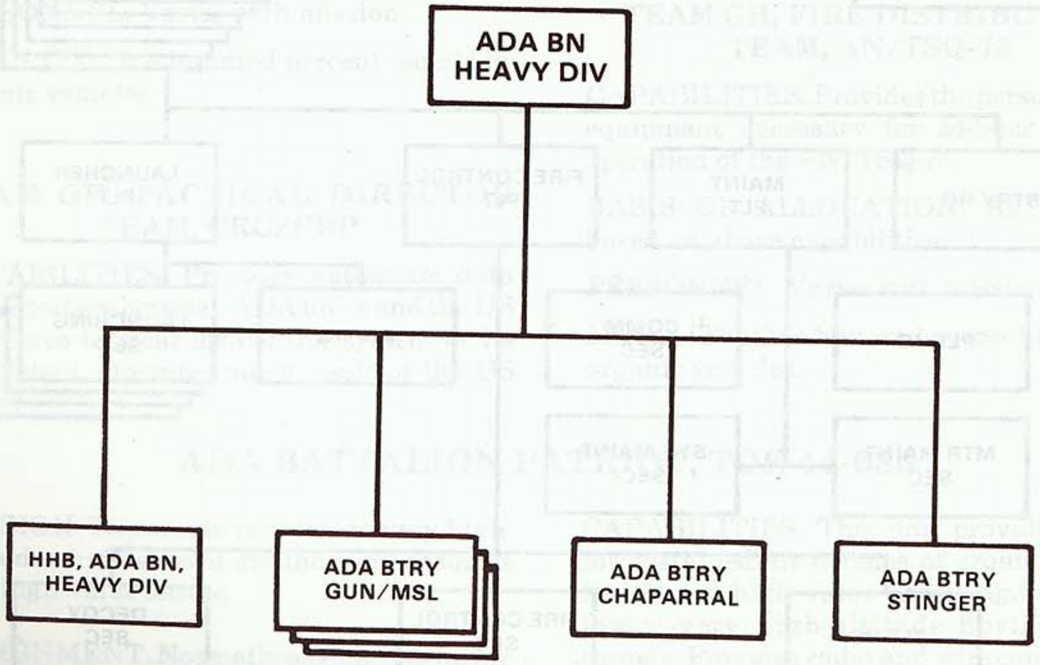
CAPABILITIES. Provides air defense against low-altitude hostile aircraft; effective ground fire against surface targets with the SGT York Gun when not required in the air defense role; and forward area alerting radar capability. Provides unit level medical support to include emergency medical treatment, operation of the battalion aid station; evacuation of patients to the aid station, and aidmen to the firing batteries; air defense coordination to each divisional brigade and any supporting high- or medium-air defense artillery battalion or the air defense artillery group; and provides air defense artillery personnel and equipment to the division airspace management element (DAME).

BASIS OF ALLOCATION. One per armored or mechanized infantry division.

PERSONNEL. Officers 48; warrant officers 11; enlisted 817; total 876.

MOBILITY. One hundred percent mobile in organic vehicles, and 100 percent air portable in US Air Force aircraft.

ADA BATTALION HEAVY DIVISION, TOE 44-165



ADA SIGNAL OPERATION BATTALION, (ADA BDE) TOE 11-175

MISSION. To provide signal communications support for an air defense artillery brigade/command headquarters and three to five assigned or attached ADA groups.

ASSIGNMENT. Organic to an air defense brigade/command.

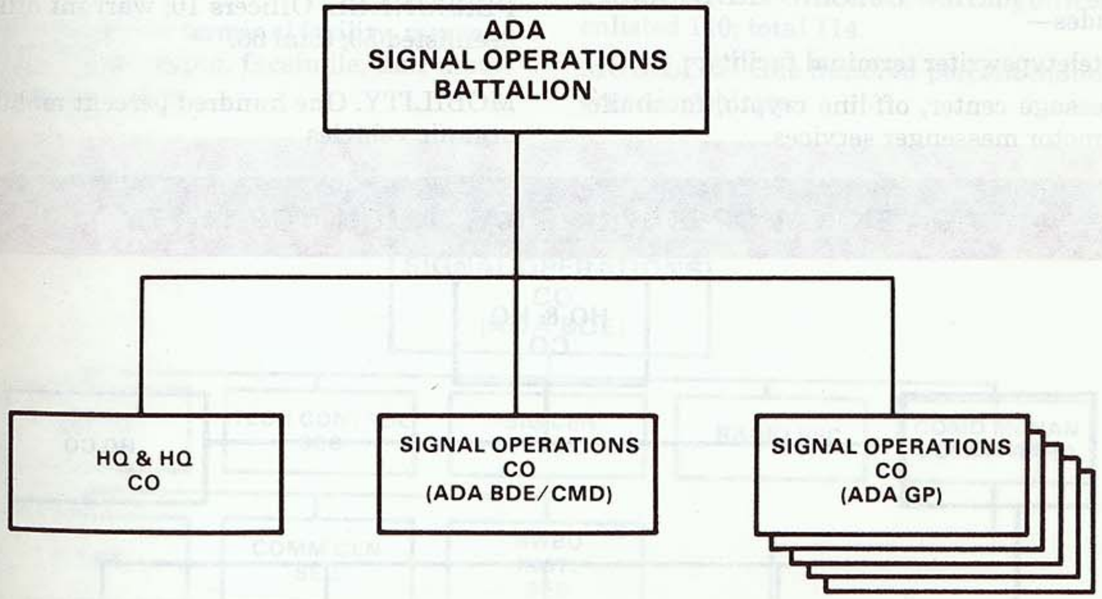
CAPABILITIES. Provides on a 24-hour basis—

- A multichannel communications system which provides telephone, teletypewriter, and data channels to link together an ADA brigade/command headquarters, three to five ADA group headquarters, and 15 to 20 ADA battalions.
- Command communications centers for an ADA brigade/command and three to five ADA groups. Each center includes radio, telephone, and teletypewriter facilities; and message center, off-line crypto, facsimile and motor messenger services.

PERSONNEL. Officers 28; warrant officers 9; enlisted 953; total 990.

MOBILITY. One hundred percent mobile.

ADA SIGNAL OPERATIONS BATTALION, TOE 11-175



HEADQUARTERS AND HEADQUARTERS COMPANY, ADA SIGNAL OPERATIONS BATTALION, TOE 11-176

MISSION. To plan, control, and coordinate operations and training of an ADA signal operations battalion. To provide administrative and logistical support for an ADA signal operations battalion.

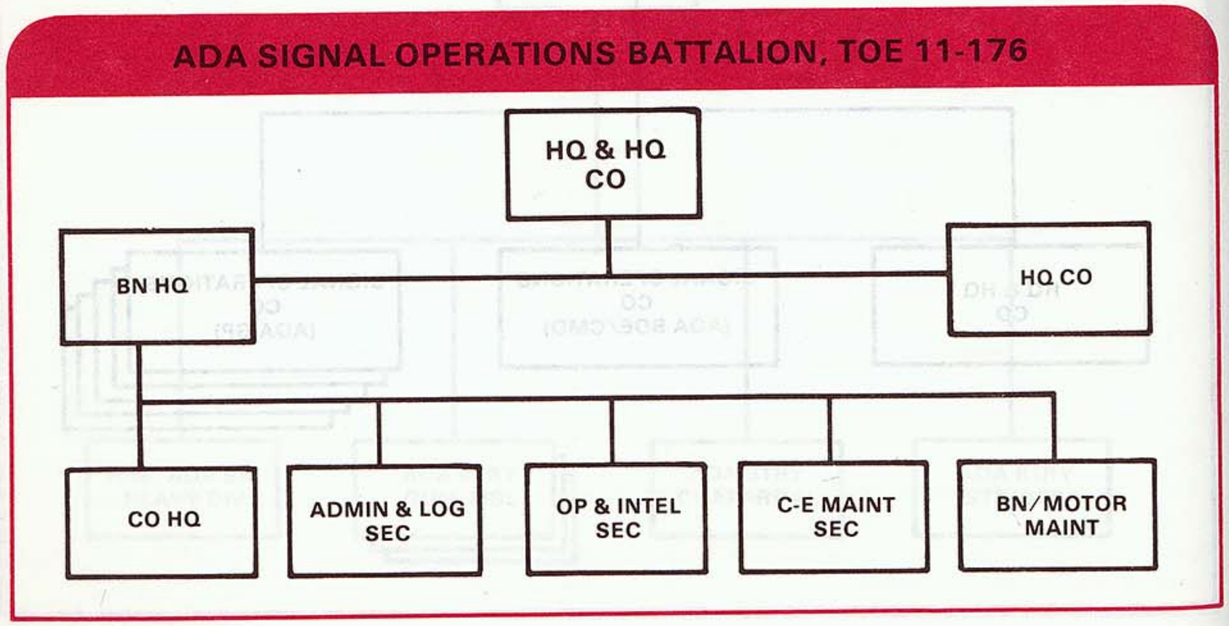
ASSIGNMENT. Organic to an air defense artillery signal operations battalion, TOE 11-175.

CAPABILITIES. Provides on a 24-hour basis—

- A low-capacity, multichannel communications system and repeater facilities to provide telephone, teletypewriter, and data channels between an ADA brigade/command headquarters and three to five assigned or attached ADA groups, to include lateral systems between groups.
- A command communications center which includes—
  - A teletypewriter terminal facility.
  - Message center, off-line crypto, facsimile and motor messenger services.
  - A 100-line manual telephone center office and local telephone distribution system.
  - A radio-wire-integration (RWI) facility.
  - Two single sideband (SSB) voice radio stations for operations in the ADA brigade command net.
  - Six radio teletypewriter (RATT) stations for operations in the ADA brigade command RATT net which includes one for the brigade command post and one for each of the five ADA groups.
  - Technical control and circuit patching facilities.
- FM radios for operation of the battalion command and systems control (SYSCON) nets and to provide initial line-up for the multichannel communications system.

PERSONNEL. Officers 10; warrant officers 3; enlisted 53; total 66.

MOBILITY. One hundred percent mobile in organic vehicles.


ADA SIGNAL OPERATIONS BATTALION, TOE 11-176

ADA SIGNAL OPERATIONS COMPANY (ADA BRIGADE), TOE 11-177

MISSION. To provide signal communications support for an ADA brigade command headquarters.

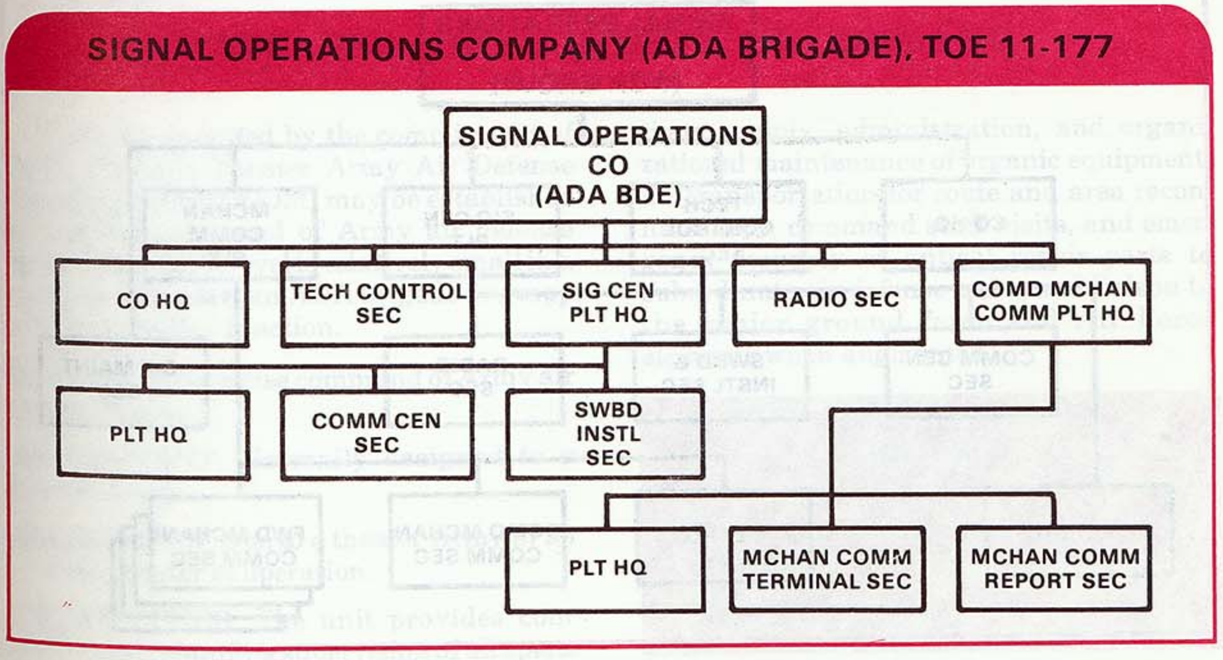
ASSIGNMENT. Organic to an air defense artillery signal operations battalion, TOE 11-175.

CAPABILITIES. Provides on a 24-hour basis—

- A low-capacity, multichannel communications system and repeater to provide telephone, teletypewriter, and data channels between ADA brigade command headquarters and three to five assigned or attached ADA groups, to include lateral systems between groups.
- A command communications center which includes—
  - A teletypewriter terminal facility, message center, off-line crypto, facsimile, and motor messenger services.
  - A technical control and circuit patching facility, a 100-line manual telephone center office facility and a local telephone distribution system.
  - A radio-wire-integration (RSI) facility.
  - Two SSB-voice radio stations in the ADA brigade command net.
  - Six RATT stations in ADA brigade command RATT net which includes one station for the brigade command post and one for each of the five ADA groups.
  - Technical control and circuit patching facilities.
- FM radios for operation of the battalion command and systems control (SYSCON) nets and to provide lineup for the multichannel communications system.

PERSONNEL. Officers 3; warrant officers 1; enlisted 110; total 114.

MOBILITY. One hundred percent mobile in organic vehicles.


SIGNAL OPERATIONS COMPANY (ADA BRIGADE), TOE 11-177

ADA SIGNAL OPERATIONS COMPANY (ADA GROUP), TOE 11-178

MISSION. To provide signal communications support for an ADA group.

ASSIGNMENT. Normally organic to an ADA signal operation battalion, TOE 11-175. May be assigned to an ADA group in independent operations.

CAPABILITIES. Provides on a 24-hour basis–

■ A low-capacity multichannel communications system and repeater capability to provide telephone, teletypewriter, and data channels between an ADA group headquarters and four assigned or attached ADA battalions, to include lateral systems between battalions.

■ A command communications center for an ADA group headquarters which includes—

□ A teletypewriter terminal facility.

□ Message center, off-line crypto, facsimile and motor messenger services.

□ A 60-line manual telephone center office, technical and circuit control facilities.

□ A radio-wire-integration (RWI) facility.

□ Two SSB-voice radio stations for operation in the ADA group command RATT net.

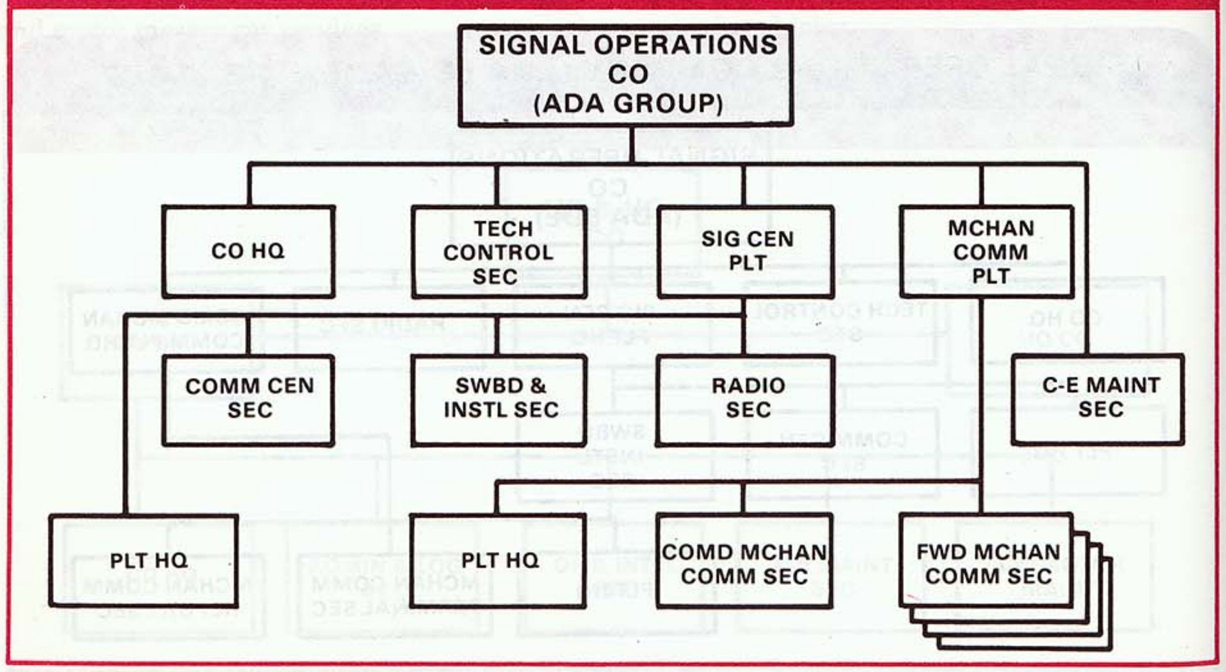
□ A full duplex radio teletypewriter net control station (NCS) for operation in the ADA group command RATT net.

■ FM radios for operation of the battalion command and systems control net and to provide initial line-up for the multichannel communications system.

PERSONNEL. Officers 3; warrant officers 1; enlisted 158; total 162.

MOBILITY. One hundred percent mobile in organic vehicles.

ADA SIGNAL OPERATIONS COMPANY (ADA GROUP), TOE 11-178



CHAPTER 7

ADA Organizations - Above Battalion

The composition of ADA units above the battalion level is flexible and is determined by the requirements of a specific situation or mission. At present, all former ADA groups have been provisionally formed under the brigade TOE. The MTOEs for these units closely reflect the TOEs with the exception of the general officer in command.

THEATER ARMY AIR DEFENSE COMMAND

When warranted by the commitment of large forces, a Theater Army Air Defense Command (TAADCOM) may be established to exercise command of Army air defense forces. If the force level is relatively small in a particular theater, an ADA brigade or group will perform this function.

MISSION. To exercise command of Army air defense forces.

ASSIGNMENT. Normally assigned to a theater Army.

ALLOCATION. One to a theater Army in an oversea theater of operation.

CAPABILITIES. The unit provides command, staff planning supervision of all operations; supply, administration, and organizational maintenance of organic equipment; air transportation for route and area reconnaissance, command staff visits, and emergency resupply of critical repair parts to subordinate air defense units; and liaison to the senior ground force and Air Force elements when augmented.

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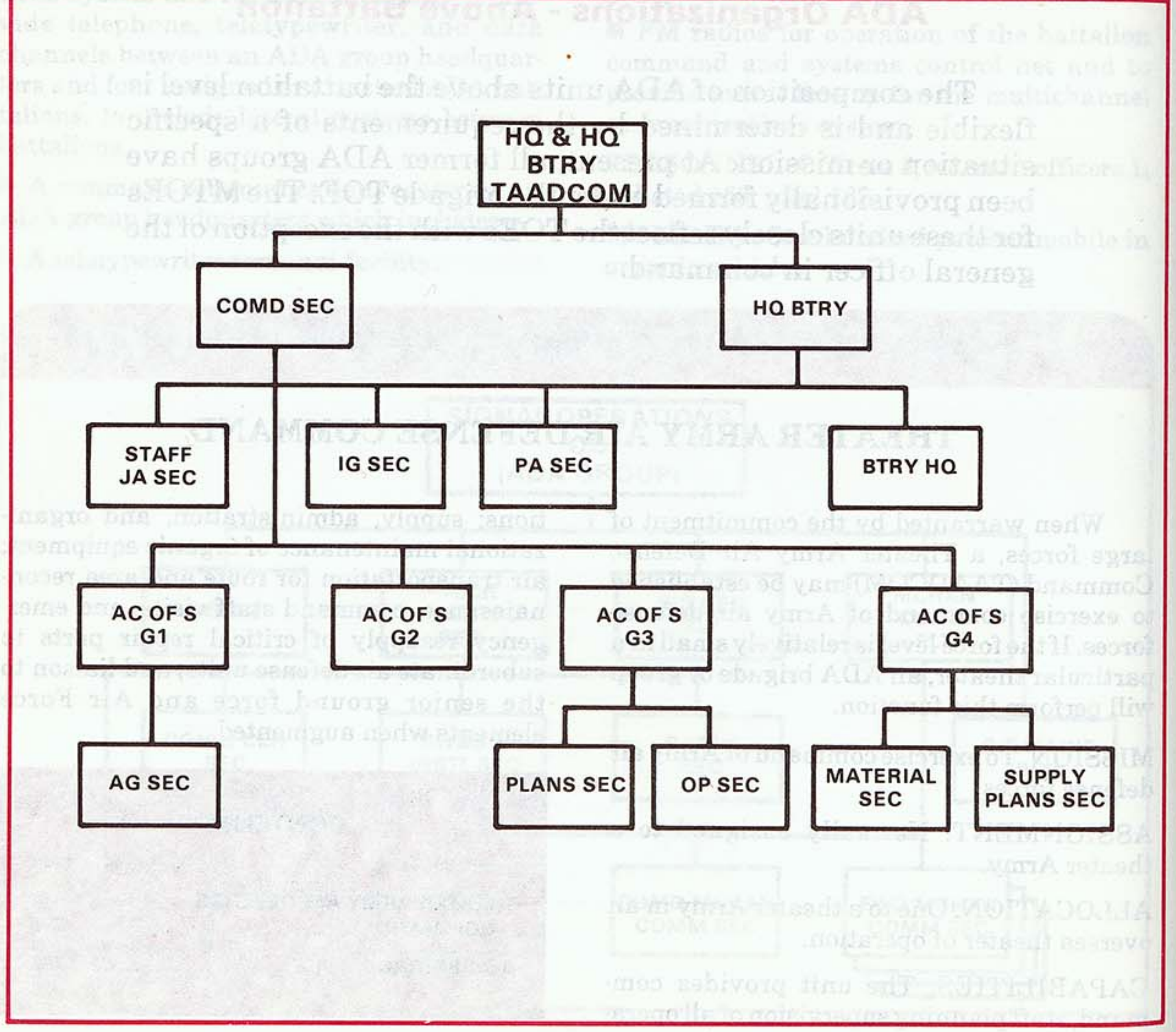
ADA BRIGADE 7-3

This unit is dependent upon appropriate elements of the theater Army for personnel administration and finance services; for mess support when unit is augmented; for automotive maintenance support when unit is augmented; and for communications support.

PERSONNEL. General officers 2 (1 MG, 1 BG); officers 40; warrant officers 2; enlisted 94; total 138. Normally, HHB TAADCOM MTOE will be augmented by teams from TOE 44-510 and 44-520.

MOBILITY. One hundred percent mobile in organic vehicles.

THEATER ARMY AIR DEFENSE COMMAND, HEADQUARTERS AND HEADQUARTERS BATTERY, TOE 44-1



ADA BRIGADE

MISSION. To plan, direct, and coordinate operations of subordinate air defense artillery battalions and other units employed in air defense operations.

ASSIGNMENT. Normally assigned to a theater Army, an Army air defense command, or other similar major headquarters within a theater of operation.

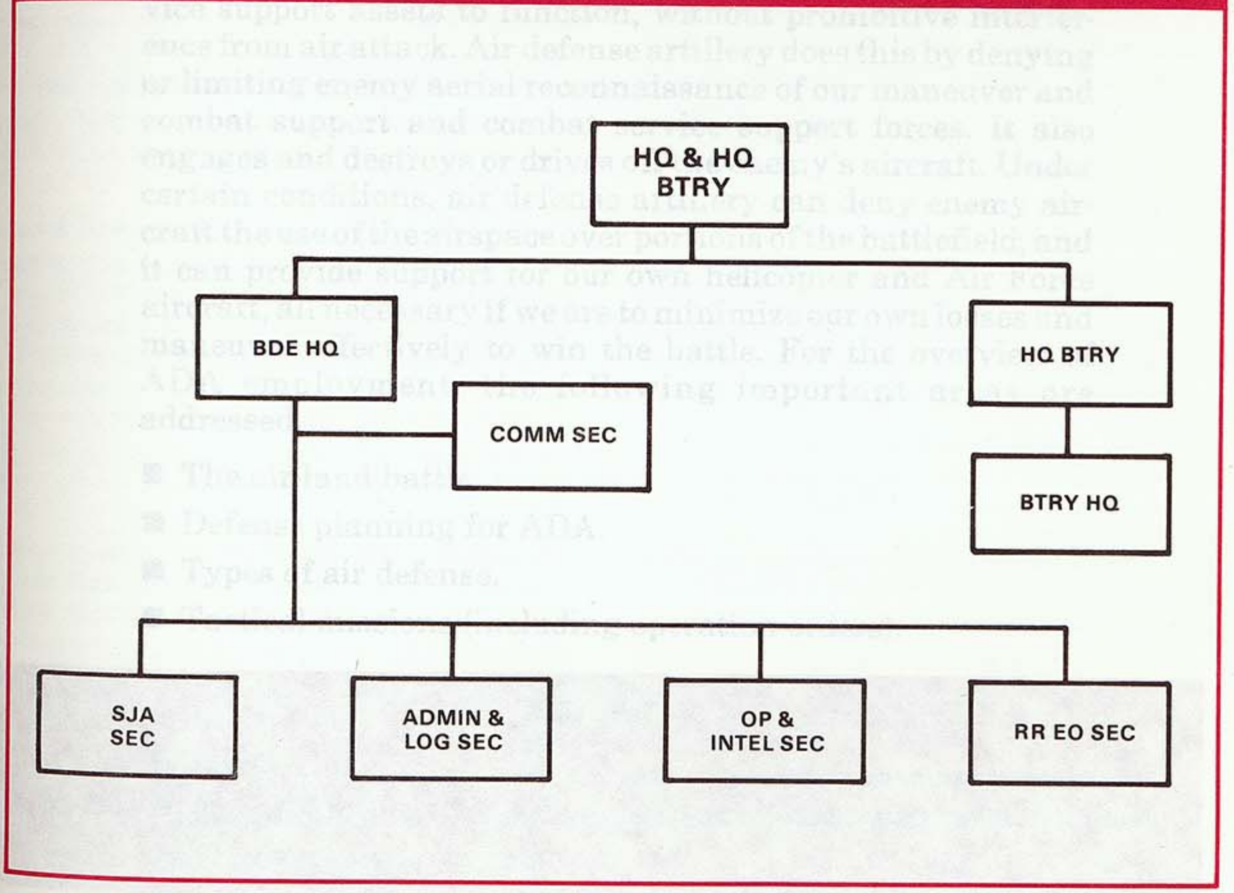
CAPABILITIES. Provides command, staff planning, and supervision of operations; and supply, administration, and organizational maintenance of all organic equipment except communications. Additional capabilities, when required for specific deployment, may be added by augmentation.

ALLOCATION. One or more to a theater Army, an Army air defense command, or other major headquarters within a unified command.

PERSONNEL. General officer 1 (BG); officers 22; warrant officers 3; enlisted 57; total 83.

MOBILITY. Seventy-five percent mobile in organic vehicles.

ADA BRIGADE, HEADQUARTERS AND HEADQUARTERS BATTERY, TOE 44-2



CHAPTER 8

Tactical Employment

Air defense includes US Marine Corps, US Navy, and Air Force interceptor aircraft and Army ground-based air defense weapon systems. No single air defense weapon can counter the variety of aircraft ordnance and countermeasures in use today. To protect against air attack, the force commander first establishes air defense priorities, based on his estimate of the tactical significance and relative vulnerability of potential targets. Air defense weapons are then employed according to target priority, using mixes of weapons, by massing them in areas to be defended. The most important contribution air defense artillery makes to promote battlefield success is to allow maneuver units to move, and combat support and combat service support assets to function, without prohibitive interference from air attack. Air defense artillery does this by denying or limiting enemy aerial reconnaissance of our maneuver and combat support and combat service support forces. It also engages and destroys or drives off the enemy's aircraft. Under certain conditions, air defense artillery can deny enemy aircraft the use of the airspace over portions of the battlefield; and it can provide support for our own helicopter and Air Force aircraft, all necessary if we are to minimize our own losses and maneuver effectively to win the battle. For the overview of ADA employment, the following important areas are addressed:

- The air-land battle.
- Defense planning for ADA.
- Types of air defense.
- Tactical missions (including operation orders).

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THE AIR-LAND BATTLE

AirLand Battle Doctrine is an offensively oriented operational concept which describes three simultaneous battles—the main battle area fight, the deep attack, and the rear area protection fight—conducted at all levels on an extended and integrated battlefield.

AirLand Battle Doctrine increases logistical and command and control requirements due to extended operational distances, and impacts substantially on the establishment of air defense priorities and on the allocation of ADA weapons to protect those priorities.

The procedure for the establishment of AD priorities still requires ground commanders to evaluate each asset for its criticality, recuperability, and vulnerability as well as the threat. Previously, however, when combat efforts focused primarily on the main battle area, air defense priorities tended to be concentrated toward main battle area assets. In particular, maneuver units and their associated command and control facilities received priority of air defense protection to the exclusion of the many other divisional facilities. Such will not be the case in the air-land battle. Maneuver commanders, with the recommendations of supporting ADA commanders, must now consider how air defense of each specific asset will influence not only the main battle area fight, but the deep attack and rear area protection efforts as well.

As air-land battle operations transition between the defense and the offense and the designated main effort shifts, air defense priorities will also shift. Flexible ADA task organization is essential to such operations and, as such, the practice of habitually associating specific packages of ADA units with specific maneuver units is not supportive of AirLand Battle Doctrine. Additionally, as the list of assets requiring active air defense protection expands, the ability of organic ADA resources to meet the maneuver commanders' requirements diminishes. It is conceivable that in certain situations, very critical assets will be given little, if any, dedicated active air defense protection. This indicates the increasing importance to the ADA commander of distributing the limited amount of available ADA resources to best support the complex operations of all three areas of the air-land battle.

The enhanced importance of careful asset prioritization, considered defense planning, and realistic ADA resources allocation represents the most significant fallout of AirLand Battle Doctrine on air defense artillery operations.

DEFENSE PLANNING FOR ADA

The phases of defense planning for ADA are analysis, defense design, evaluation of alternatives, and implementation.

ANALYSIS

The supported commander establishes his ADA priorities. The ADA commander carries them out. After establishing defense priorities the supported force commander, and the ADA commander begin the defense planning process by considering the factors of mission, enemy, terrain, troops, and time (METT-T) available. The product of this analysis phase is a recommended initial allocation of assets to defend the prioritized assets of the supported force commander.

DEFENSE DESIGN

During the defense design phase, the ADA planner considers—

- ADA employment principles (mass, mix, mobility, integration).
- ADA employment guidelines (balanced fires, weighted coverage, mutual support, overlapping fires, early engagement, and defense in depth).
- Defense design requirements (the factors of METT-T considered in conjunction with specific weapon system characteristics).

Defense design results in the establishment of specific locations for each ADA weapon in the defense.

EVALUATION OF ALTERNATIVES

This phase consists of comparing possible courses of action to determine and select the plan which provides the most effective, flexible air defense protection for the specific tactical situation.

IMPLEMENTATION

During this phase, the following action takes place: the briefing of the supported commander on the selected defense plan, preparing essential operation plans and orders, and disseminating this information to subordinates. This is followed by the implementation of the design plan by each subordinate as he considers the following eight troop-leading steps:

1. Receive the mission.
2. Issue the warning order.
3. Make a tentative plan to accomplish the mission.
4. Initiate the necessary movement sequence.
5. Reconnoiter.
6. Complete the plan.
7. Issue orders.
8. Supervise and refine.

TYPES OF AIR DEFENSE

Defense design is a process using AD employment principles, ADA employment guidelines, and ADA defense design requirements. These, in conjunction with the weapon system capabilities, aid in determining the location of specific ADA weapons in the defense of each AD priority. Prior to initiating this process, the planner must determine the type of air defense to be designed. In most cases, this will be specified in the ADA commander's guidance.

There are two types of air defense: ***area defense*** and ***point defense.***

AREA DEFENSE

Area defense is a posture designed for defense of a broad area. No particular asset receives priority of defense. Fighter aircraft have primary responsibility for providing area air defense; their flexibility, mobility, and reusability make them ideal for broad area coverage.

A belt defense is a specialized application of an area defense where HIMAD units are in a linear configuration to provide early attrition of enemy aircraft as they attempt to penetrate the rear areas.

POINT DEFENSE

Point defense is a posture designed for the protection of a more limited area, normally in the defense of the vital elements of a force or the vital installations of the rear area. Priority of defense is given to specific assets. These assets may be mobile or static.

ADA STANDARD TACTICAL MISSIONS

An ADA standard tactical mission is a tactical mission which can be assigned to any type ADA unit. Each standard tactical mission assigns specific responsibilities to the receiving unit and establishes a specific and definite command relationship between the supported and supporting units. The relationship associated with each mission type is shown in illustration below. The four standard tactical missions are general support (GS), general support-reinforcing (GS-R), reinforcing (R), and direct support (DS).

COMMAND RELATIONSHIPS AND RESPONSIBILITIES (ADA STANDARD TACTICAL MISSIONS)

	GENERAL SUPPORT	GENERAL SUPPORT-REINFORCING	REINFORCING	DIRECT SUPPORT
Who establishes AD priorities?	The supported commander.	(1) The supported commander. (2) The supported commander through the reinforced ADA commander.	The supported commander through the reinforced ADA commander.	The supported commander.
Who locates the ADA unit?[1]	The commander assigning the mission in coordination with the supported force ground commander.	The commander assigning the mission in coordination with the supported force ground commander.	The reinforced ADA commander in coordination with the supported force ground commander.	The DS ADA commander with approval of the local ground commander.
Who positions ADA fire units?[2]	ADA fire unit commanders in coordination with the local ground commander.	ADA fire unit commanders in coordination with the reinforced ADA unit commander and the local ground commander.	ADA fire unit commanders with approval of the reinforced ADA unit commander and the local ground commander.	ADA fire unit commanders with approval of the local ground commander.
With whom to establish liaison?	As required by commander assigning GS mission.	As required, but including the reinforced ADA commander.	As required, but including the reinforced ADA commander.	Supported unit commander.
With whom to establish communications?	As required by commander assigning GS mission.	As required, but including the reinforced ADA unit.	As required, but including the reinforced ADA unit.	Supported unit.

NOTES:

1. The terms "locates/locating" specify the establishment of a broad operating area (commonly, a "goose egg").
2. The terms "positions/positioning" specify the selection of an exact point within the operating area. (Although not addressed here, the terms "sites/siting" specify the placement of individual items of equipment on selected spots within the position.)
3. The HIMAD battalion commander normally positions the unit, while the fire unit commander normally sites the major items of equipment within the position.

OPERATION ORDERS AND PLANS

Although tactical employment involves many considerations, commanders are uniquely concerned with operation orders and plans. Orders are of two general classes: ***combat*** and ***routine***.

Combat orders set forth the details of tactical operations and administration in the field. They may be issued initially as a plan to become an order at some future specified time, or as certain contingencies arise. An operation order (OPORD) is a directive issued by a commander to subordinate commanders for the purpose of effecting the coordinated execution of an operation. This term is general and includes both operation orders for the conduct of tactical operations and for movement orders.

Routine orders cover normal administrative operations in garrison or field service and include general, special, and letter orders, court-martial orders, bulletins, circulars, and memorandums. For more detailed information concerning operation orders and plans, see FM 101-5.

Plans provide for the coordinated action required to carry out the decision of the commander for the conduct of a future or an anticipated tactical operation. The two primary differences between plans and orders are that orders are based on facts while plans are based on assumptions that are included in the plan, and the time for execution of an order is known and specified, while the time of a specified occurrence or contingency will dictate the execution of a plan. Types of combat orders and plans include the following:

- An ***operation order*** provides for the coordinated action to carry out the decision of a commander in the conduct of an operation. This term is general and includes both operation orders for the conduct of tactical operations and movement orders. Combat service support commanders also use operation orders to task their own units.
- A ***warning order*** gives preliminary notice of actions or orders that are to follow to give subordinates maximum time for preparation. It is usually a brief oral or written message. It has no specific format but should contain four essential elements—the addresses, the nature of the operation, the time of the operation, and the time and place the operation order/plan is to be issued.
- A ***fragmentary order*** is normally used to issue supplemental instructions or changes to a current operation order or operation plan while the operation is in progress. It provides brief, specific, and timely instructions without loss of clarity. It follows the basic format of a five-paragraph operation order but elements may be omitted when these elements have not changed, are not essential to the mission, might delay or complicate transmission, or are unavailable or incomplete at the time of issue.
- An ***administrative/logistics order*** provides the coordinated combat service support for a command. It is normally prepared and used at division or higher level.
- A ***standing operating procedure (SOP)*** is a set of instructions which prescribes routine methods to be followed in operations. It is used to supplement other combat orders and has the same authority.
- A ***strategic plan*** provides for the overall conduct of war.
- A ***campaign plan*** is designed to outline a series of related military operations to accomplish a common objective, normally within a given time and space. With the increasing range of weapons and wide dispersion of units in modern war, these plans often are prepared by a joint headquarters.
- An ***operation plan (OPLAN)*** is for a military operation (normally part of a military campaign). It may cover a single operation or a series of connected operations to be carried out simultaneously or in succession. It implements operations derived from campaign plans. When the time or conditions under which the plan is to be placed in effect occurs, the plan becomes an operation order.
- An ***administrative/logistics plan*** for handling traffic, supply, medical evacuation/hospitalization, and other details of combat

service support operations. It is based upon the requirements of the operation of the command as determined by appropriate estimates. When placed into effect, it becomes an administrative/logistics order.

■ An ***air defense annex*** to an operation order/plan is prepared by the unit (Division, Brigade, Battalion Air Defense Officer). This ADA annex is an integral part of the order and is intended to amplify, clarify and promote understanding concerning additional information that applies to ADA missions. An ADA annex follows the basic five-paragraph format presented for the operation order/plan and it may include an overlay, or sketch. The heading, acknowledgement, command line, and authentication are required when the Air Defense Annex is issued by separate distribution or given wider distribution than the basic OPORD/OPLAN.

■ ***Other Plans.*** A supporting plan complements another plan. Example: A fire support plan complements an OPLAN. An alternate plan provides for the accomplishment of a mission in a different manner. (Example: an air assault operation instead of a ground operation). A contingency plan provides for major contingencies that can be reasonably anticipated in the principal geographic subareas of the command. (Example: an enemy airborne/air assault attack in a rear area of the command).

OPERATION ORDER FORMAT

(CLASSIFICATION)

Determined by G3/S3 classified per AR 380-5

Show copy number, issuing unit, place of issue, date-time-group message reference number

Copy ___ of ___ copies
HQ 11th ADA
Munich (GP 1218) Ger.
___ 1600 ___

OPORD----: No. provided by G3/S3 run serially for calendar year—1—, 2—, etc.

References: List any maps, charts, or other documents required to understand the order

(CLASSIFICATION)

(CLASSIFICATION)

Time zone used throughout the order: The zone applicable to the operation.

Task organization: Task organization (Organization for Combat) developed by G3/S3 based on commander's decision. Task organization indicates how the commander plans to allocate his combat power.

1. Situation
   a. Enemy forces
   b. Friendly Forces
   c. Attachments/detachments

Always contains three paragraphs.
a. Provided by G3/S3.
b. Extracts from OPORD next higher headquarters.
c. Determined by G3/S3 from OPORD next higher headquarters.

2. Mission

The mission is a clear, concise statement of the task to be accomplished by the command.

3. Execution
   a. Concept of operation
   b. ------
   c. ------
   d. Coordinating instruction

Derived by G3/S3 from commander's decision; states scheme of maneuver and plan of fire support. Separate subparagraphs give specific tasks to be accomplish by each element of the command having a tactical mission.

4. Service support
   a. General
   b. Materiel and services
   c. Civil-military operations

Provided by G4/S4 in coordination with G1/S1, G5, and support command commander and appropriate special staff officers. If instructions are numerous/voluminous, they may be included in an annex and reference made to them in para 4. Annex designations are provided by G3/S3.

5. Command and signal

Contains command and signal instructions. As a minimum, makes reference to the CEOI annex.

(CLASSIFICATION)

(CLASSIFICATION)

Acknowledge:

Directs recipient of the order to acknowledge receipt. Acknowledgement may be in the clear using message reference number.

SMITH
MG

The maneuver commander or his designated representative signs the original. If signature is not reproducible, the G3/S3 authenticates subsequent copies.

OFFICIAL:

JONES
GS/SE

For the Commander
DRELLING
Chief of Staff

Annexes:
A/H

Annexes are lettered alphabetically and are listed in the order in which they appear in the OPORD. G3/S3 designates letter to be associated with a given annex. Annexes are prepared by the staff officer having subject matter responsibility.

Distribution: A

Distribution formula is included in SOP. G3/S3 establishes distribution.

(CLASSIFICATION)

FIRST SAMPLE OF ADA ANNEX

(CLASSIFICATION)

Copy ___ of ___ copies
3-441 ADA (C/V) 54th Mech
BIERSPLATZ FRG 805672
010500 Jan 1981
A24

EXAMPLE

ANNEX D (AIR DEFENSE) TO OPORD 20 ---- 54th Mech Div

REFERENCE: Map series USACGSC 50-229, EUROPE, SHEET 1 (FRIEDBURG -- FRANKFURT), EDITION 1974, 1:50,000

TIME ZONE USED THROUGHOUT ORDER: ALPHA

TASK ORGANIZATION: 3-441 ADA

A/3-441 ADA (-)
    1/C/3-441 ADA

C/3-441 ADA (-)
    1/A/3-441 ADA
    1/B/2-441 ADA
    1st & 2nd FAAR Section

B/3-441 ADA (-)
    2/c/3-441 ADA
    1st Sec/4/A/3-441 ADA (STINGER)
    3rd FAAR Section

D/3-441 ADA
    FAAR Platoon (-)

1. SITUATION

a. Enemy Forces:

(1) Annex A (Intelligence) to OPORD 20 (omitted).

(2) Capabilities.

(a) Threat has battalion air assault capability.

(b) The possibility exist for attack helicopters to augment threat forces.

(CLASSIFICATION)

(CLASSIFICATION)

(c) The threat can employ chemical agents with air assets.

(3) Strength. 11th TAA supports 10th CAA with two attached regiments (64 Flogger D) of the 3rd Fighter Division and two attached regiments of the 5th Fighter Bomber Division (64 Fencer A). Aircraft maintenance problems and qualified pilot shortages appear evident as the estimated sorties rate per day is under 2.5, normally it would be 4-5. These four regiments are at full aircraft assigned strength. Estimated sorties, therefore, are 20-25 ground attack and 18-20 intercepter in the division sector daily. Aerial reconnaissance and electronic warfare missions can also be expected along the division sector. 11th TAA can support 10th CAA with assets for a battalion size air assault (HIPs) with HIND-D attack helicopters in support. Threat is operating with standard air tactics.

(4) Significant Activities.

(a) Threat air was employed heavily during the initial phase of hostilities, and they have sustained significant casualities in both aircraft and pilots. Air parity exists at present, with the Threat capable of air superiority in a particular area for a short time only. Threat is presently using his air assets cautiously at non-surge rate.

(b) Threat operating from forward tactical airfields to include the following:

1. Unnamed field at ___________.

2. Unnamed field at ___________.

3. As necessary.

(c) Neutralization of friendly ADA is a top priority for the Threat.

(5) Avenues of Approach.

(a) AA #1 begins at _______________ then runs West to _______________ then to _______________. This is considered the most likely air approach due to the screening effect of the terrain in that area.

(b) AA #2 begins at ___________ then runs Southwest to _________ then West to _________. The Threat aircraft is exposed to friendly radar coverage the entire approach.

(6) Terrain and Weather.

(a) The dense woods throughout the sector inhibits good air defense fields of fire. Reliance on the Manual SHORAD Control System is stressed. The ridge lines in the Division Sector have an impact on air defense.

(b) Weather at this time of the year is usually very rainy with a cloud ceiling. Expect the enemy to make maximum use of breaks in weather for air attack.

b. Friendly Forces:

(CLASSIFICATION)

(CLASSIFICATION)

(1) 3-441 ADA (C/V) is in Direct Support of 54th Mech Div.

(2) A/3-441 ADA (V) is in Direct Support of 3rd Bde.

(3) B/3-441 ADA (V) is in Direct Support of 2nd Bde.

(4) C/3-441 ADA (C) (-) is in General Support of 1st Bde.

(5) D/3-441 ADA (C) (-) is in Direct Support of DISCOM.

(6) 4-1 ADA (Hawk) is in General Support of 54th Mech.

(7) Elements of 12th ATAF supports 1 (US) CORPS.

c. Attachments and Detachments. A/3-441 ADA attached to 201st ACR, initially. Attachment effective at (DATE TIME GROUP).

2. MISSION

The 3-441 ADA (C/V) is in Direct Support of 54th Mech, providing low altitude air defense no later than (DATE TIME GROUP) within the division sector.

3. EXECUTION

a. Concept of Operation:

(1) Maneuver: 3-441 ADA provides low-altitude air defense protection for maneuver units, DISCOM, Division main, and provides low-altitude air defense for 201th ACR during covering force operation and movement through division sector.

(2) Fire Support.

(a) Hostile criteria.

1. Any aircraft engaging friendly elements in sight.

2. Any aircraft conducting unannounced spraying or minelaying operations.

3. Any aircraft dropping unannounced airborne troops into friendly lines.

4. Any aircraft recognized as hostile by designated criteria.

5. Others as appropriate.

(b) Weapons Control Status.

1. Weapons HOLD: Do not fire - the right of self-defense is never denied.

2. Weapons TIGHT: Fire only on aircraft positively identified as hostile.

3. Weapons FREE: Fire only on aircraft not identified as friendly.

(CLASSIFICATION)

(CLASSIFICATION)

(c) Air Defense Warning.

1. RED: Air attack imminent or in progress.

2. YELLOW: Air attack probable.

3. WHITE: Air attack is not expected.

(d) Passive Air Defense. Good cover, concealment and dispersion practices are critical in protecting division assets.

(e) Small Arms Air Defense. Small arms are aimed two football fields in front of fast movers; 1/2 a football field in front of slow moving aircraft and helicopters; aircraft coming directly at you aim slightly above the nose of the craft. REMEMBER: A VOLUME OF FIRE IN FRONT OF THE AIRCRAFT.

(f) Air Defense Priorities.

1. 201st ACR.

2. Maneuver Units.

3. Division Main.

4. DISCOM.

(g) Manual SHORAD Control System.

1. Frequency ______.

2. Initial Reference Point (grid).

3. This is a MONITOR ONLY frequency.

b. The 3-441 ADA (C/V). Appendix 1 (ADA operations overlay).

(1) A/3-441 ADA initially attached to 201st ACR. Two composite Gun/Stinger platoons will provide air defense of passage points in sector to deny close aerial observation of the forces at the passage points. One composite Chaparral/-Stinger platoon will provide ADA coverage to the 201st Headquarters and field trains. On order DS to 3d Brigade. Priority of protection to brigade trains and supporting artillery in that order.

(2) B/3-441 ADA: DS to 1st Brigade. Priority of protection to brigade trains and supporting artillery in that order.

(3) C/3-441 ADA: DS to 2d Brigade. Priority of protection to brigade trains and supporting artillery in that order.

(4) D/3-441 ADA: GS to DISCOM. Priority of protection to DISCOM class III and V distribution point vicinity (vic) ____, and division main in that order.

(5) FAAR Plt/HHB/3-441 ADA: Priority of positioning in order.

(CLASSIFICATION)

(CLASSIFICATION)

(a) Alert/early warning for C/V fire units in 1st Brigade.

(b) Alert/early warning for C/V fire units in support of DISCOM.

c. Coordinating Instructions.

(1) A Battery coordinates ADA fires with ADA units organic to 201st ACR.

(2) Annex H (Airspace utilization) to OPORD 20 (omitted).

(3) Weapons control status is TIGHT* initially.

(4) FCO to 1/206 (Hawk) vicinity ________.

4. SERVICE SUPPORT

a. Annex J (Service Support) to OPORD 20 (omitted).

b. Operator maintenance will be performed daily.

5. COMMAND AND SIGNAL

a. Command.

(1) 3-441 ADA (C/V) CP is located at ________ vic Beirsplatz. On order, will displace to ________.

(2) Alternate CP is D Battery CP vic ________.

b. Signal.

(1) Annex L (Communications-Electronics) to OPLAN 20.

(2) IFF Mode 3A see appendix 2 (omitted).

Mode 4 IAW Code Book #________.

(3) Communications-Electronics Operation Instruction (CEOI) Index 3 in effect.

ACKNOWLEDGE:

FLETCHER
MG

OFFICIAL:
STANTON, LTC
ADA OFFICER

Appendixes:
1 - ADA operations overlay.
2 - Mode 3A codes (omitted).

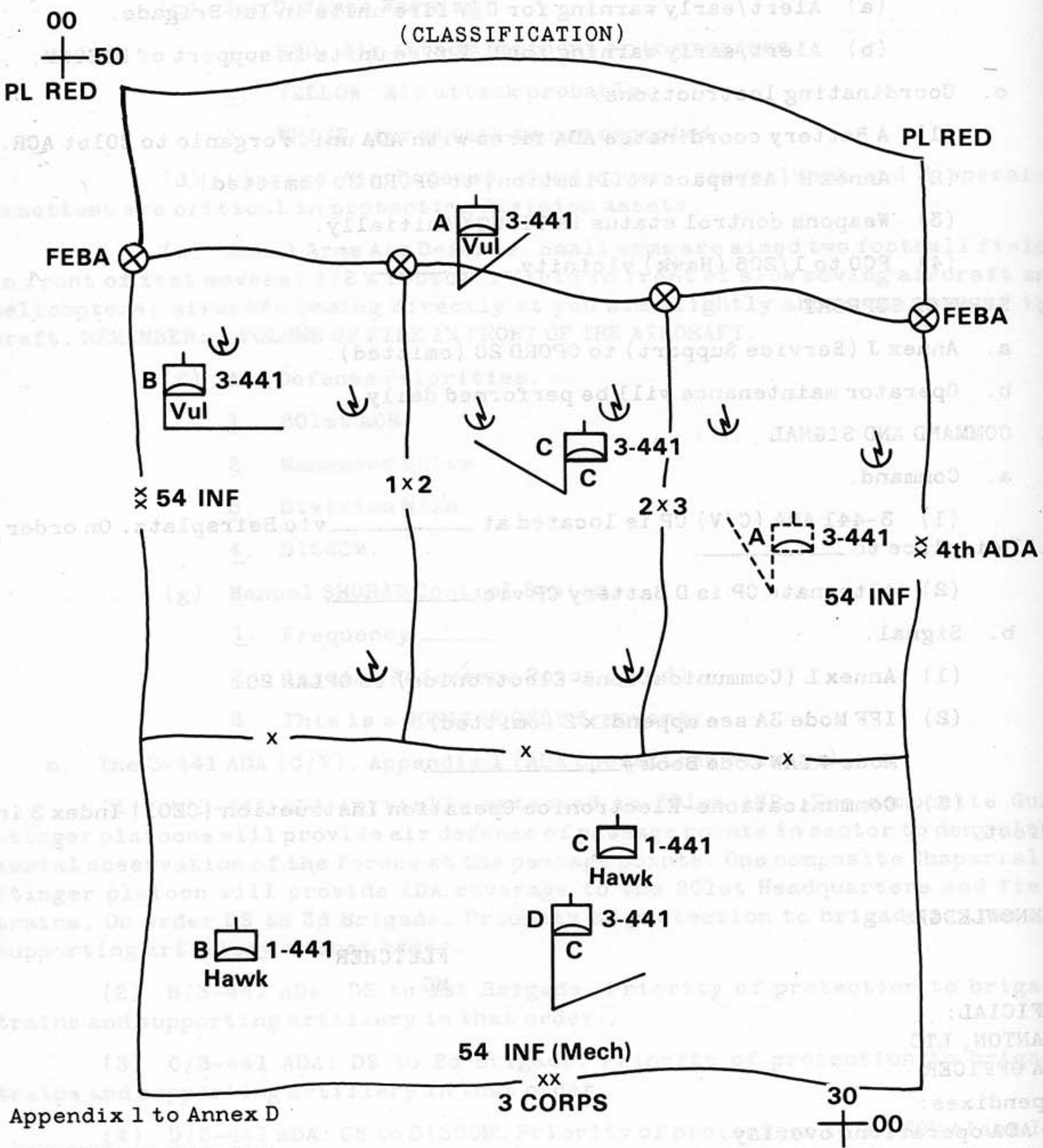
DISTRIBUTION: A

*Note: Terminology used here can be either FREE, TIGHT or HOLD.

(CLASSIFICATION)

APPENDIX 1 TO ANNEX D

(CLASSIFICATION)



Appendix 1 to Annex D

OPORD 20–54 Mech Div

Reference Map Series USACGSC 50–229, Europe, Sheet 1, (Freidburg-Frankfurt), Edition 1974, 1:50,000.

(CLASSIFICATION)

SECOND SAMPLE OF ADA ANNEX

(CLASSIFICATION)

Copy ___ of ___ copies
B Btry 3-441 ADA 54th Mech
BONHEIM NA 798264 FRG
010700 Jan 1981
KS 28

EXAMPLE

ANNEX J (AIR DEFENSE) TO OPORD 21 --- 1st BDE 54th Mech

REFERENCE: Map series USACGSC 50-229, EUROPE, SHEET 1 (FRIEDBURG -- FRANKFURT), EDITION 1974, 1:50,000

TIME ZONE USED THROUGHOUT ORDER: ALPHA

TASK ORGANIZATION:

B/3-441 ADA (V) (-)

2/C/3-441 (C)

1st Sec/4/A/3-441 (S)

3rd FAAR Section

1. SITUATION

a. Enemy Forces:

(1) Annex A (INTELLIGENCE) to OPORD 21 (omitted).

(2) Capabilities.

(a) Threat has battalion air assault capability.

(b) The possibility exist for attack helicopters to augment Threat forces.

(c) The Threat can employ chemical agents with air assets.

(3) Strength: 11th TAA supports 201st Regiment with two attached regiments (50 Flogger B) of the 3rd Fighter Division and two attached regiments of the 5th Fighter Bomber Division (50 Fencer A). Aircraft maintenance problems and qualified pilot shortages appear evident as the estimated sortie rate per day is under 2.5, where it would be 4-5. These four regiments are at full aircraft assigned strength. Estimated sorties, therefore, are 15-20 ground attack and 10-15 intercepter in the division sector daily. Aerial reconnaissance and electronic warfare missions can also be expected along the brigade sector. The 11th TAA can support

(CLASSIFICATION)

(CLASSIFICATION)

201st Regiment with assets for a battalion size air assault (HIPs) with HIND-D attack helicopters in support. Threat is operating with standard air tactics.

(4) Significant Activities.

(a) Threat air was employed heavily during the initial phase of hostilities, and they have sustained significant casualities in both aircraft and pilots. Air parity exists at present, with the Threat capable of air superiority in a particular area for a short time only. Threat is presently using his air assets cautiously at non-surge rate.

(b) Threat is operating from forward tactical airfields to include the following:

1. Unnamed field at ________.
2. Unnamed field at ________.
3. As necessary.

(c) Neutralization of friendly ADA is a top priority for the Threat.

(5) Avenues of approach.

(a) AA #1 begins at ________ then runs West to ________ then to ________. This is considered the most likely air approach due to the screening effect of the terrain in that area.

(b) AA #2 begins at ________ then runs Southwest to ________ then West to ________. The Threat aircraft is exposed to friendly radar coverage the entire approach.

(6) Terrain and weather.

(a) The dense woods throughout the sector inhibits good air defense fields of fire. Reliance on the Manual SHORAD Control system is stressed. The ridge lines in the division sector have an impact on air defense.

(b) Weather at this time of the year is usually very rainy with a cloud ceiling. Expect the enemy to make maximum use of breaks in weather for air attack.

b. Friendly Forces.

(1) 3-441 ADA (C/V) is in Direct Support of 54th Mech Div.

(2) A/3-441 ADA (V) (-) is in Direct Support of 3rd Bde.

(3) C/3-441 ADA (C) (-) is in General Support of 1st Bde.

(4) D/3-441 ADA (C) (-) in in Direct Support of DISCOM.

(5) 4-1 ADA (Hawk) is in General Support of 54th Mech.

(6) Elements of 12th ATAF supports 1 (US) CORPS.

(CLASSIFICATION)

(CLASSIFICATION)

c. Attachments and Detachments.

(1) Attachments: None.

(2) Detachments: 1/B/3-441 ADA attached to C/3-441. Detachment effective at (DATE TIME GROUP).

2. MISSION

B/3-441 ADA (V) (-) is in direct support of 1st Bde providing low altitude air defense no later than (DATE TIME GROUP) within the brigade sector.

3. EXECUTION

a. Concept of Operation.

(1) Maneuver: B/3-441 ADA provides low-altitude air defense protection for Brigade CP, Brigade trains, 2-24 FA and maneuver units, (Refer to Appendix 1, OPS overlay).

(2) Fire Support.

(a) Hostile criteria.

1. Any aircraft engaging friendly elements in sight.
2. Any aircraft conducting unannounced spraying or minelaying operations.
3. Any aircraft dropping unannounced airborne troops into friendly lines.
4. Any aircraft recognized as hostile by designated criteria.
5. Others as appropriate.

(b) Weapons Control Status.

1. Weapons HOLD: Do not fire - the right of self-defense is never denied.
2. Weapons TIGHT: Fire only on aircraft positively identified as hostile.
3. Weapons FREE: Fire only on aircraft not identified as friendly.

(c) Air Defense Warning.

1. RED: Air attack imminent or in progress.
2. YELLOW: Air attack probable.
3. WHITE: Air attack is not expected.

(CLASSIFICATION)

(CLASSIFICATION)

(d) Passive Air Defense. Good cover, concealment and dispersion practices are critical in protecting division assets.

(e) Small Air Defense. Small arms are aimed two football fields in front of fast movers; 1/2 a football field in front of slow moving aircraft and helicopters; aircraft coming directly at you aim slightly above the nose of the craft. REMEMBER: A VOLUME OF FIRE IN FRONT OF THE AIRCRAFT.

(f) Air Defense Priorities.

1. Maneuver Units.

2. Brigade Trains.

3. 2-24 FA.

4. Brigade CP.

(g) Manual SHORAD Control System.

1. Frequency ______.

2. Initial Reference Point (grid).

3. This is a MONITOR ONLY frequency.

b. 2/B. (DS).

(1) Priority of protection to Bde trains vic ________.

(2) 0/0 protection Bde CP.

c. 3/B. (DS).

(1) Priority of protection to TF Mech (3.78).

(2) 0/0 protect TF Armor (2-76).

d. 4/B. (Stinger).

(1) Initially 1st Section GS protects Passage Point 1 vic ________. 0/0 protects Bde CP.

(2) 2d Section (GS) protects 2-24 FA and will displace with 2-24 FA.

(3) 3d and 4th Sections provide DS support to TF Mech (3-78) and TF Armor (2-76) respectively.

e. 2/C. (GS) Provide protection to Bde trains.

f. 1 Sec/4/A. (DS) Protect TF Cover (2-78).

g. FAAR. FAAR 3 will emplace vic ________.

0/0 displace to ________.

(CLASSIFICATION)

(CLASSIFICATION)

h. Coordinating Instructions.

(1) Weapons control status will be TIGHT* initially.

(2) Platoon Leader 4/B coordinate protection of passage points with A Btry.

(3) Platoon Leader 2/C defense commander for Bde trains.

(4) Annex H (Airspace utilization) to OPORD 20 54th Mech Division (omitted).

4. SERVICE SUPPORT

a. Annex L (Service Support) to OPORD 21 (omitted).

b. Operator maintenance will be performed daily.

5. COMMAND AND SIGNAL

a. Command.

(1) CP will be located vic ________ initially.

(2) 0/0 will be displace to ________.

b. Signal.

(1) CEOI Index 3 in effect.

(2) IFF Mode 3A see appendix 2 (omitted).

Mode 4 IAW Code Book #________.

ACKNOWLEDGE:

ORMSBY
COL

OFFICIAL:
ENGLISH, CPT
ADA OFFICER

Appendixes:
1 - Operations overlay.
2 - Mode 3A codes (omitted).

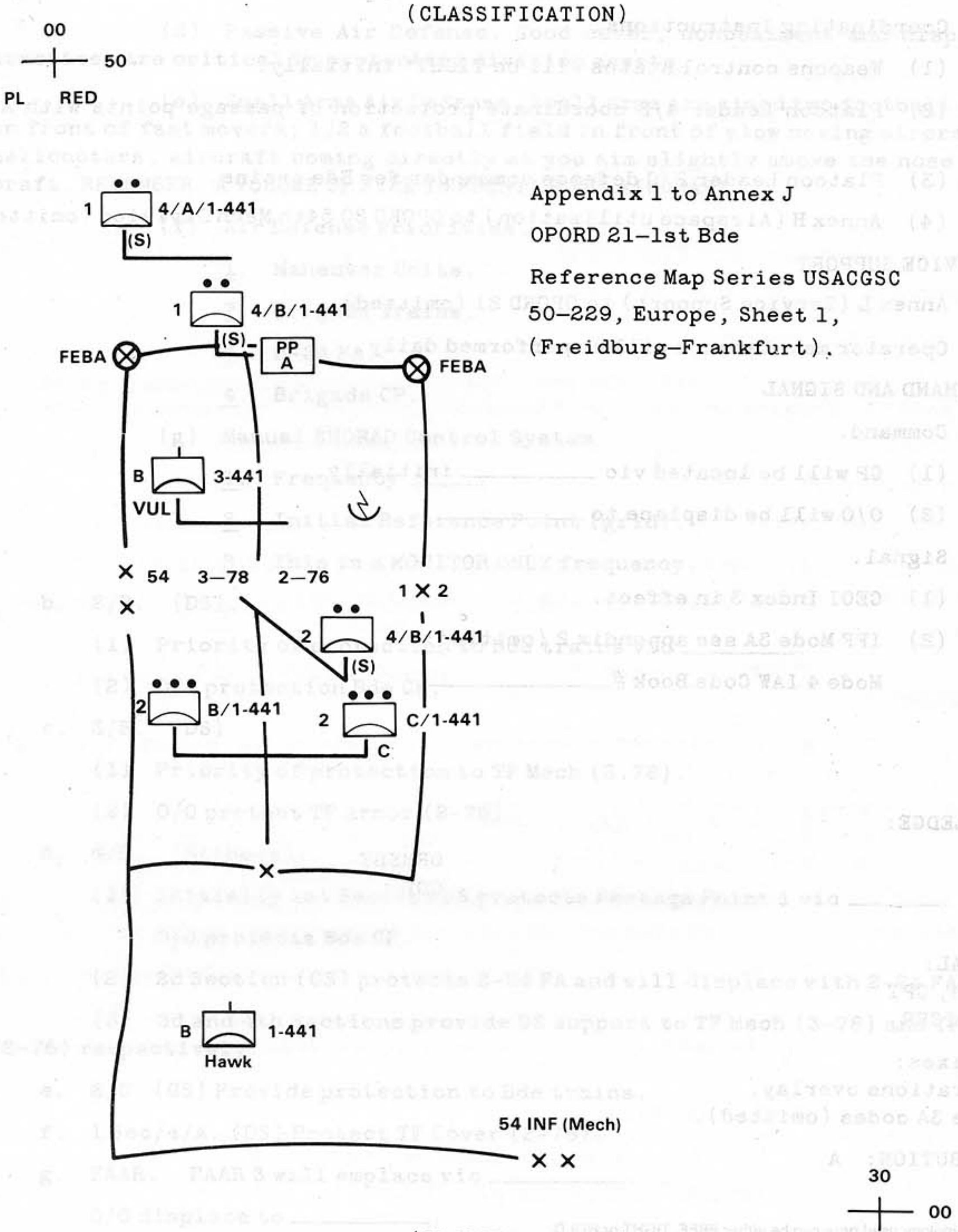
DISTRIBUTION: A

*Note: Terminology used here can be either FREE, TIGHT or HOLD.

(CLASSIFICATION)

APPENDIX 1 TO ANNEX J

(CLASSIFICATION)



Appendix 1 to Annex J
OPORD 21–1st Bde
Reference Map Series USACGSC
50–229, Europe, Sheet 1,
(Freidburg–Frankfurt).

(CLASSIFICATION)

THIRD SAMPLE OF ADA ANNEX

(CLASSIFICATION)

Copy ___ of ___ copies
A Btry 1-76 ADA 19 Mech
LEWISHEIM, WA
021300 Jan 1984
KS 05

EXAMPLE

ANNEX D (AIR DEFENSE) TO OPORD 05 TASK FORCE BLUE (Bn Size)

REFERENCE: Map series V7915, 1:50,000; sheets 14771, 14771V, 147811, 157811.

TIME ZONE USED THROUGHOUT ORDER: ZULU

TASK ORGANIZATION:

1/A/1-76 ADA

1 Sec/4/A/1-76 ADA

1. SITUATION

a. Enemy Forces:

(1) See Annex B (INTELLIGENCE) to OPORD 05 (omitted).

(2) Capabilities.

(a) Threat has battalion air assault capability.

(b) The possibility exist for attack helicopters to augment Threat forces.

(c) Threat forces can employ chemical agents with air assets.

(3) Strength: 11th TAA supports 10th CAA with one attached regiment (37 Flogger B) of the 3rd Fighter Division. Aircraft maintenance problems and qualified pilot shortages appear evident as the estimated sortie rate per day is under 2.5, normally it would be 4-5. The regiment is at full aircraft assigned strength. Estimated sorties, therefore, are 10-15 ground attack and 8-10 intercepter in the task force sector daily. Aerial reconnaissance and electronic warfare missions can also be expected along the task force sector. 11th TAA can support 10th CAA with assets for a battalion size air assault (HIPs) with HIND-D attack helicopters in support. Threat is operating with standard air tactics.

(CLASSIFICATION)

(CLASSIFICATION)

(4) Significant Activities.

(a) Air parity exist at present, with the Threat capable of air superiority in a particular area for a short time only. Enemy is presently using his air assets cautiously at non-surge rate.

(b) Threat is operating from forward tactical airfields to include the following:

1. Unnamed field at EH 4108.
2. Unnamed field at EH 4201.
3. As necessary.

(c) Neutralization of friendly ADA is a top priority for the Threat.

(5) Avenues of Approach.

(a) AA #1 begins at EH 3808 then runs Southwest to EH 3605 then runs West to EH 2804. This is considered the most likely air approach due to the screening effect on the ridge running along side the West bank of the river. Enemy aircraft will not be seen until they have crossed the covering force area.

(b) AA #2 begins at EH 3702 runs West to EH 3603 then West to EH 2902. This approach will only be used by high speed low altitude aircraft as it is exposed to friendly radar coverage.

(6) Terrain and Weather.

(a) The dense woods throughout the sector inhibits good air defense fields of fire. Reliance on the Manual SHORAD Control system is stressed. The ridge along the Nisqually River Bridge is the only terrain feature in the area to have an impact on air defense.

(b) Weather at this time of the year is usually very rainy with a low cloud ceiling. Expect the enemy to make maximum use of breaks in weather for air attack.

b. Friendly Forces.

(1) A/1-76 ADA (V) is in Direct Support of 2nd Bde, 19th Mech Div. providing low altitude air defense.

(2) 2/A/1-76 ADA (V) is in Direct Support of Task Force BALL providing low altitude air defense.

(3) 3/A/1-76 ADA (V) is in Direct Support of Task Force CHARGE providing low altitude air defense.

(4) 3/C/1-76 ADA (C) reinforcing A/1-76 ADA vicinity Ammo Supply Point EH 230051.

(CLASSIFICATION)

(CLASSIFICATION)

(5) A/4-1 ADA (Hawk) is in General Support of 1 (US) CORPS providing low to medium altitude air defense.

(6) Elements of 12th ATAF supports 1 (US) CORPS.

c. Attachments and Detachments. FAAR team 2 is attached to 1/A/1-76 ADA (V) as of 040001 JAN 84.

2. MISSION

1/A/1-76 ADA (V) (+) is in Direct Support of Task Force BLUE, providing low altitude air defense no later than 040500 JAN 84, within the Task Force, sector.

3. EXECUTION

a. Concept of Operation.

(1) Maneuver: Phase 1, 1/A/1-76 ADA (V) provides low-altitude air defense initially for Nisqually River Bridge at EH 2830. The STINGER section provides low-altitude air defense for Task Force Trains, Task Force CP, Team BRAVO and Team ALPHA. Phase 2, on order conduct air ambush on Avenue of Approach #1 with 2 fire units of 3/C/1-76 ADA (C) and 1st and 2nd Squads of 1/A/1-76 ADA (V) (refer to Appendix 1).

(2) Fire Support.

(a) Hostile criteria.

1. Any aircraft engaging friendly elements in sight.
2. Any aircraft conducting unannounced spraying or minelaying operations.
3. Any aircraft dropping unannounced airborne troops into friendly lines.
4. Any aircraft recognized as hostile by designated criteria.
5. Others as appropriate.

(b) Weapons Control Status.

1. Weapons HOLD: Do not fire - the right of self-defense is never denied.
2. Weapons TIGHT: Fire only on aircraft positively identified as hostile.
3. Weapons FREE: Fire only on aircraft not identified as friendly.

(CLASSIFICATION)

(c) Air Defense Warning.

1. RED: Air attack imminent or in progress.
2. YELLOW: Air attack probable.
3. WHITE: Air attack is not expected.

(d) Passive Air Defense. Good cover, concealment and dispersion practices are critical in protecting division assets.

(e) Small Arms Air Defense. Small arms are aimed two football fields in front of fast movers; 1/2 a football field in front of slow moving aircraft and helicopters; aircraft coming directly at you aim slightly above the nose of the craft. REMEMBER: A VOLUME OF FIRE IN FRONT OF THE AIRCRAFT.

(f) Air Defense Priorities.

1. Nisqually River Bridge.
2. Task Force Trains.
3. Task Force CP.
4. Team BRAVO.
5. Team ALPHA.

(g) MSCS Manual SHORAD Control System.

1. Frequency ______.
2. Initial Reference Point EH 3000.
3. This is a MONITOR ONLY frequency.

b. 1st Squad.

(1) vic EH 278045.

(2) On order move to air ambush site vic EH 319048.

c. 2nd Squad.

(1) vic EH 282036.

(2) On order move to air ambush site vic EH 303048.

d. 3rd Squad vic EH 277034.

e. 4th Squad vic EH 287027.

f. STINGER Section.

(1) Team 1 – Task Force Trains vic EH 303035.

(2) Team 2 – Task Force CP vic EH 316037.

(3) Team 3 – Team BRAVO vic EH 336049.

(4) Team 4 – Team ALPHA vic EH 330022.

g. FAAR Team 2 initial location vic EH 320027, on order displace to vic EH 300015.

h. Coordinating Instructions.

(1) 12th ATAF AD TSOP.

(2) 4-1 ADA (Hawk) TSOP.

(3) 2-61 INF (Mech) TSOP.

(4) In case of conflict between SOPs on air defense matters, 12th ATAF AD TSOP will apply.

(5) Air Space Utilization (see Annex O basic OPORD) (omitted).

(6) 2/A/1-76 ADA (V) CP located vic EH 2709.

(7) 3/A/1-76 ADA (V) CP located vic EH 2898.

(8) A/4/1 ADA (Hawk) located vic EH 208033.

(9) Information Requirements.

(a) Where, when, in what strength and with what types of aircraft will the Threat employ his air assets within range of weapon systems and radars.

(b) Will the Threat mount air assault insertions: if so where, when, how, and in what strength?

(c) Will the enemy take action specifically against ADA units with air, ground, air assault or unconventional warfare attacks: if so where, when, how and in what strength?

4. SERVICE SUPPORT

a. See Annex R (Service Support to Basic OPORD) (omitted).

b. Required Supply Rate (RSR) (Daily Rate).

(1) 20 mm HEED ________ 8000 rds.

(2) 20 mm HE ________ 1600 rds.

(3) Redeye/Stinger ________ 22 rds.

(CLASSIFICATION)

c. Task Force BLUE will provide Class I, III, V (non ADA) and IX support as necessary to support DS air defense units.

d. Air defense assets will not be used in a ground role without the authority of the 2nd Brigade Commander.

e. Location of ASPs.

(1) Small arms EH 293035.

(2) Air Defense ammo EH 230051.

f. Resupply of Ammunition.

(1) Small arms–per Basic OPORD (omitted).

(2) ADA per Annex J of 1-76 ADA TSOP and Annex K of A/1-76 ADA TSOP (omitted).

g. Maintenance Execution.

(1) Evacuation–per A/1-76 ADA TSOP and 2-61 INF TSOP, items of equipment will be removed to the supported units trains.

(2) Repair Parts.

(a) Items peculiar to ADA will be corrected by authorized maintenance personnel only.

(b) Items not requiring ADA authorized maintenance personnel will be corrected by the supported unit with coordination through the Platoon Sergeant.

(3) POL.

(a) Fuel–resupply will be provided through the supported unit and accomplished at a coordinated point only during hours of limited visibility with coordination through the Platoon Sergeant.

(b) Package Products–resupply will be provided through supported unit with coordination through Platoon Sergeant.

h. Ration cycle execution.

(1) Ration cycle will be a A-C-A from the supported unit.

(2) Platoon Sergeant will coordinate the delivery of the lunch meal during the morning meal.

(3) Two mermite cans with inserts will be supplied by the Platoon to the supported unit with coordination through the Platoon Sergeant.

(CLASSIFICATION)

(CLASSIFICATION)

(4) Eating utensils will be supplied by the supported unit with coordination through the Platoon Sergeant.

i. Medical Evacuation.

(1) Possible loss of limb or life will be evacuated by the fastest means available to the Task Force BLUE medical facility located vic EH 293035.

(2) Sick call will be coordinated by the Platoon Sergeant.

5. COMMAND AND SIGNAL

a. Command.

(1) The Platoon leaders initial location will be with the 3rd squad vic EH 277034.

(2) Battery Command Post is vic EH 254027.

(3) Battalion Command Post is vic EH 232007.

b. Signal.

(1) See Annex K basic OPORD (omitted).

(2) Identification friend or foe will be accomplished IAW the 12th ATAF AD TSOP and the Code book (Appendix 2) (omitted).

ACKNOWLEDGE:

SMITH
LTC

OFFICIAL:
SMITH, 2LT
ADA OFFICER

Appendixes:
1 - ADA operations overlay (2 pages).
2 - Mode 3A codes (provided separately) (omitted).

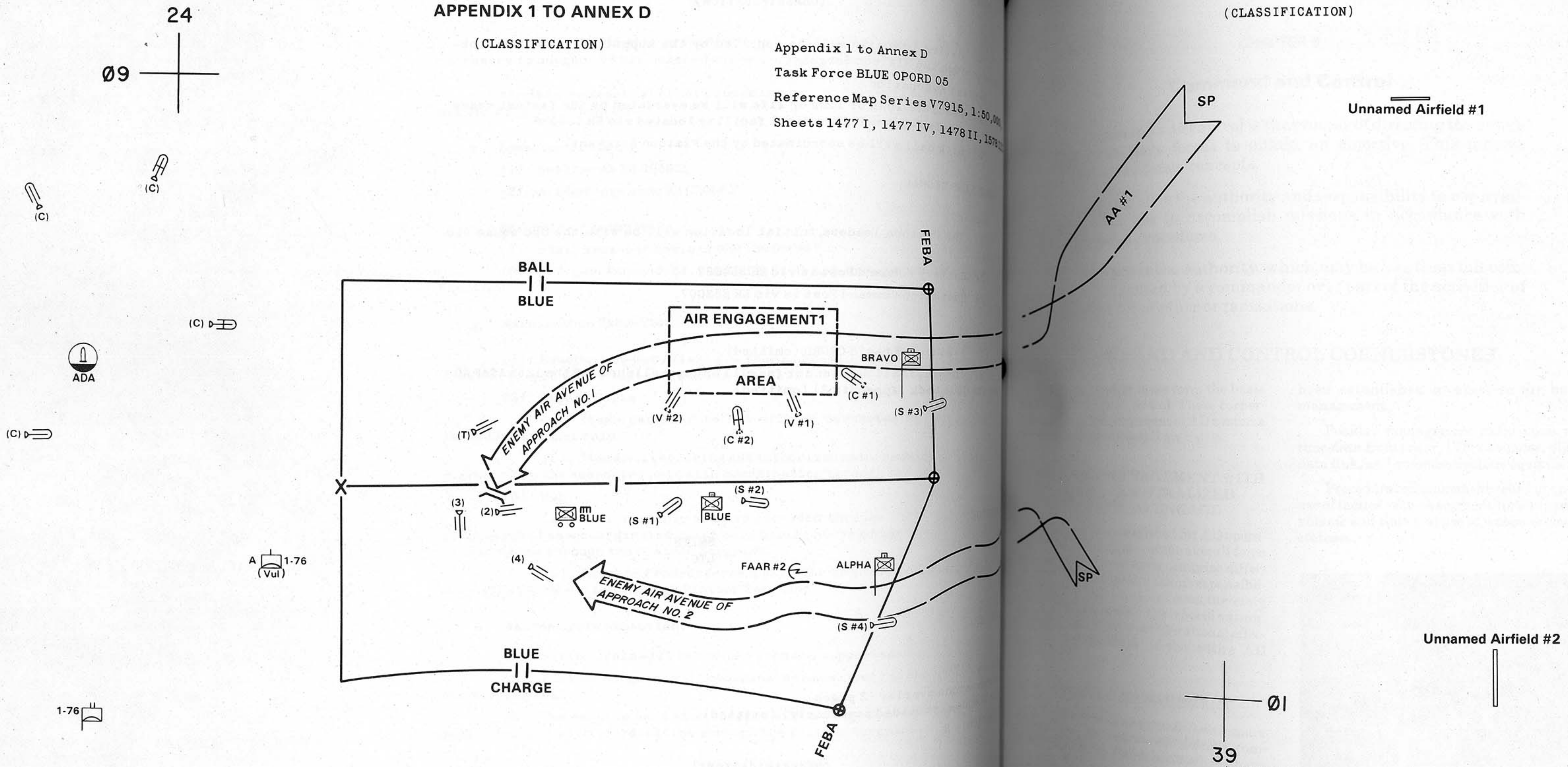
DISTRIBUTION: B

(CLASSIFICATION)

APPENDIX 1 TO ANNEX D

(CLASSIFICATION)

Appendix 1 to Annex D
Task Force BLUE OPORD 05
Reference Map Series V7915, 1:50,00
Sheets 1477 I, 1477 IV, 1478 II, 157



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CHAPTER 9

Command and Control

Command and control is the process of directing the activities of military forces to obtain an objective. This process involves two basic concepts.

Command is the authority and responsibility to use available resources to accomplish missions in accordance with established procedures.

Control is the authority, which may be less than full command, exercised by a commander over part of the activities of subordinate or other organizations.

COMMAND AND CONTROL CORNERSTONES

Three fundamental tasks form the basis for AD command and control. These cornerstones relate the management of AD systems to the conduct of the overall air battle.

CENTRALIZED MANAGEMENT WITH MAXIMUM DECENTRALIZED AUTHORITY TO ENGAGE

Organizations established for AD operations are an integral part of the overall force structure. AD organizations comprise different command levels and areas of responsibility. Centralized management must therefore be exercised to insure the coordination, integration, and maximum operational effectiveness and economy of the entire AD organization.

AIR BATTLE MANAGEMENT

Air battle management includes airspace management, as well as air defense command and control. Two basic methods have been established to exercise air battle management.

Positive management relies upon real-time data from radar, IFF, computer, digital data link, and communications equipment.

Procedural management relies upon the use of tactics such as segmenting airspace by volume and time and use of weapons control statuses.

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COMMAND AND CONTROL CORNERSTONES 9-1
COMMAND AND CONTROL CHAINS 9-2
COMMAND POSTS, TACTICAL OPERATIONS CENTERS, AND FIRE DIRECTION CENTERS 9-2
COMMAND AND CONTROL PROCEDURES 9-3

MANAGEMENT BY EXCEPTION

Situations may arise which have not been addressed in procedural or positive rules and directives. Positive management exceptions will be made on a case-by-case basis to countermand or modify previous guidance. Strict procedural management should only be used when a mix of positive and procedural techniques is not achievable.

COMMAND AND CONTROL CHAINS

ADA is unique in that it relies upon separate chains for command functions and control functions.

THE COMMAND CHAIN

The command chain links the theater commander, Army component commander, Army AD command commander, ADA brigade commander, ADA battalion commander, ADA battery commander, and the ADA platoon leader. The AD command commander and the ADA brigade commander are not part of the division chain of command. Special command statuses can be formed by attaching or placing the ADA unit—

- Under tactical control.
- In attachment (US, NATO).
- Under operational command/operational control (US), operational command (NATO), or operational control (NATO) of another unit. Reference FM 44-1.

THE CONTROL CHAIN

The theater commander assigns responsibility for air defense and airspace control to a single commander. This is normally the Air Force airspace component commander, who is also the area air defense commander (AADC). The AADC manages by coordinating and integrating the entire air defense effort within the command. He may create air defense regions and appoint a commander for each. The region air defense commander (RADC) may be selected from any service component. The region air defense commander is normally located at the next subordinate command and control facility below the tactical air control center (TACC), which is usually a subordinate control and reporting center (CRC). The CRC controls subordinate ADA fire direction centers from brigade, to battalion, to battery, or individual ADA fire unit. In certain theaters, a sector operations center (SOC) is interposed between the RADC and the CRC.

COMMAND POSTS, TACTICAL OPERATIONS CENTERS, AND FIRE DIRECTION CENTERS

ADA headquarters and headquarters elements were formerly known as AADCPs, group operations centers (GOCs), and battalion operations centers (BOCs). These nonstandard terms for Army air defense command and control facilities have been *eliminated.* The new standard terms for these facilities are as follows:

- Command Post. A command post (CP) is a unit or subunit headquarters where the commander and staff perform their activities.
- Tactical Operations Center. A tactical operations center (TOC) is a subelement of a CP for headquarters with staff elements (AADCOM, brigade, or battalion). It consists of a physical grouping of the staff elements concerned with current tactical operations and tactical support.

- Fire Direction Center. A fire direction center (FDC) is that subelement of brigade and battalion TOCs and battery and platoon CPs where the commander exercises fire direction and/or fire control.

COMMAND AND CONTROL PROCEDURES

The area air defense commander manages the integrated air defense through the use of the command and control structures and procedures. The three categories of command and control procedures are—

1. Warning procedures and alert statuses.
2. Rules of engagement.
3. Supplemental fire control measures.

WARNING PROCEDURES AND ALERT STATUSES

Warning procedures and alert statuses are measures taken to alert, prepare, or increase unit readiness for combat.

Defense readiness conditions (DEFCON) describe progressive alert postures.

Weapons alert designators (WAD) describe a progressive system of alert postures based on the DEFCON.

States of readiness (SOR) describe the degree of readiness of ADA fire units expressed in minutes from time of alert notification to time of weapon firing.

Air defense warnings (ADW) are the commander's evaluation of the probability of air attack within his area of operations. ADWs are as follows:

- ADW RED - Attack by hostile aircraft or missiles is imminent or in progress.
- ADW YELLOW - Attack by hostile aircraft or missiles is probable.
- ADW WHITE - Attack by hostile aircraft or missiles is improbable.
- Air Defense Emergency - An emergency condition (declared by either the Commander in Chief, North American Air Defense Command (NORAD), or Commander in Chief, Aerospace Defense Command) which exists when attack upon the Continental United States, Canada, or US installations in Greenland by hostile aircraft or missiles is considered probable, is imminent, or is taking place.

RULES OF ENGAGEMENT

Rules of engagement (ROE) are the positive and procedural management directives issued by competent military authority, which specify the circumstances and limitations under which forces will initiate or continue combat engagement with other encountered forces (JCS Pub 1). There are seven components of rules of engagement.

Right of Self-Defense

The right of self-defense is the responsibility of commanders at all echelons to take whatever action is required to protect their forces and equipment against air attack.

Hostile Criteria

Hostile criteria are basic rules promulgated by the commanders of unified or specified commands which are used by echelons having identification authority to determine if detected targets are friendly or hostile.

Level of Control

Level of control describes the AD echelon at which positive management of the air battle is being conducted.

Modes of Control

The modes of control are centralized control and decentralized control.

Centralized control which is the control mode whereby a higher echelon authorizes target engagements to fire units (JCS Pub 1).

Decentralized control is the normal wartime mode of control for air defense whereby a higher echelon monitors unit actions, making direct target assignments to units only when necessary to insure proper fire distribution, to prevent engagement of friendly aircraft, or to prevent simultaneous engagements of hostile aircraft (JCS Pub 1).

Autonomous Operations

This is the mode of operation assumed by a unit after it has lost all communications with higher echelons. The unit commander assumes full responsibility for control of weapons and engagement of hostile targets (JCS Pub 1).

Weapons Control Statuses

These statuses describe the relative degree under which the fires of AD systems are managed.

Weapons free. Weapons can fire at any aircraft not positively identified as friendly. This is the least restrictive weapons control status (ATP 42).

Weapons tight. Fire only at aircraft positively identified as hostile according to the prevailing hostile criteria (ATP 42).

Weapons hold. Do not fire except in self-defense or in response to a formal order. This is the most restrictive weapons control status (ATP 42).

Fire Control Orders

These orders are commands which are used to control AD engagements on a case-by-case basis, regardless of the prevailing weapons control status.

Engage. This command is used to order a fire unit to engage (fire on) a specific target. This order cancels any previous fire control order which may have been given on that track (ATP 42).

Cease engagement. This command is used to stop tactical action against a specified target and is always followed by an engage command. This order may be used to change an ongoing engagement of one target to another of higher priority. Missiles in flight are allowed to continue to intercept. In NATO, this order may also be used to preclude simultaneous engagement of a target by more than one weapon system (ATP 42). *Does not* apply to nonautomated ADA systems or Patriot. (See CEASE FIRE.)

Hold fire. This is an emergency fire control order to stop firing and all tactical action to include the destruction of any missiles in flight. This order may be used to protect friendly aircraft.

Cease fire. This is a command given to ADA units to refrain from firing on, but to continue to track, an airborne object. Missiles in flight are allowed to continue to intercept (JCS Pub 1). This command is used to prevent simultaneous target engagements by manned fighters and ADA units. (Does not apply to nonautomated ADA systems and is not currently recognized as a fire control order in some theaters.)

Cover. This command is used to order a fire unit to assume a posture that will allow engagement of a target if directed. For radar-directed systems, this means achieving a radar lock on a specified target. This order can be used for targets that are presently being engaged by another fire unit or for targets that have yet to become a significant threat. Units that receive this command report tracking, lock on, and ready to fire to higher echelons as these statuses are achieved. (Does not apply to nonautomated ADA systems or Patriot.)

Engage hold (Patriot only). This command is used to temporarily restrain a fire unit from automatically engaging a target. If the fire unit has not fired, target tracking continues. Missiles in flight are allowed to continue to intercept. This command cannot be automatically transmitted from a brigade level AN/TSQ-73 to a Patriot unit at this time.

Stop fire. This is an emergency fire control order to temporarily halt the engagement sequence due to internally unsafe fire unit conditions. It is seldom transmitted outside the fire unit. This command can be given by anyone in the fire unit who detects an unsafe condition. The engagement continues after the unsafe condition has been corrected. (This order is not recognized as a fire control order in some theaters.)

SUPPLEMENTAL FIRE CONTROL MEASURES

Supplemental fire control measures are procedural management measures issued by competent military authority which delineate or modify hostile criteria, delegate identification authority, or which serve strictly as aids in fire distribution or airspace control. The supplemental fire control measures are as follows:

■ ***Air defense operations area.*** Air defense operations area (ADOA) is an area and the airspace above it within which procedures are established to minimize mutual interference between air defense and other operations.

■ ***Weapon engagement zone.*** Weapon engagement zone (WEZ) identifies a volume of defined airspace within which a specific type of AD weapon is preferred for use in an engagement. Commonly used WEZs include—

□ Fighter engagement zone (FEZ).

□ High-altitude missile engagement zone (HIMEZ).

□ Low-altitude missile engagement zone (LOMEZ).

□ Short-range air defense engagement zone (SHORADEZ).

■ ***High density airspace control zone.*** High density airspace control zone (HIDACZ) is airspace of defined dimensions in which there is a concentrated employment of numerous and varied airspace users.

■ ***Temporary airspace restrictions.*** Three common temporary airspace restrictions are—

1. *Restricted operations area* identifies airspace of defined dimensions within which the operation of one or more airspace users is restricted, generally for a short time.

2. *The minimum risk route (MRR)* and *low-level transmit route (LLTR)* are temporary corridors of dimensions defined by specified echelons that pass in either direction through ADA defenses, an HIDACZ, or through a restricted operations area. They are designed to reduce risk to aircraft transiting the tactical operations area at low altitudes. The WCS for MRR/LLTR will normally be maintained at WEAPONS TIGHT.

3. *Standard use Army aircraft routes* identify temporary corridors of defined dimensions passing in either direction through the rear operations area to designated points in the tactical operations area. The weapons control status for ADA fire units whose engagement ranges intercept an activated standard-use route remains at WEAPONS TIGHT for that part of the route.

Sectors of fire and primary target lines are established to assist in the distribution of ADA fires. These limits must be clearly defined by right and left azimuths. Those ADA units with automated tactical data systems must know whether they are to assign and engage air targets within or beyond the stated sector boundaries.

CHAPTER 10

ADA Communications Equipment

The ability of ADA unit commanders to react to rapidly changing conditions on the AirLand battlefield depends on rapid and reliable communications. Radio and wire communications are provided units to facilitate command and control functions on the battlefield. This chapter provides information on some important communications/electronics and ancillary communications equipment used by ADA units. The chapter begins with a graphical presentation of the joint communications-electronics equipment designation system.

JOINT COMMUNICATIONS-ELECTRONICS EQUIPMENT DESIGNATION SYSTEM

All signal equipment nomenclature starting with "AN-" indicates the joint communications-electronics equipment designation system was used to identify the signal end item. The following illustration graphically identifies the meaning of the letters and numbers used in this designation system.

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NEW GENERATION OF RADIO SETS 10-7
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WIRE COMMUNICATIONS EQUIPMENT 10-15
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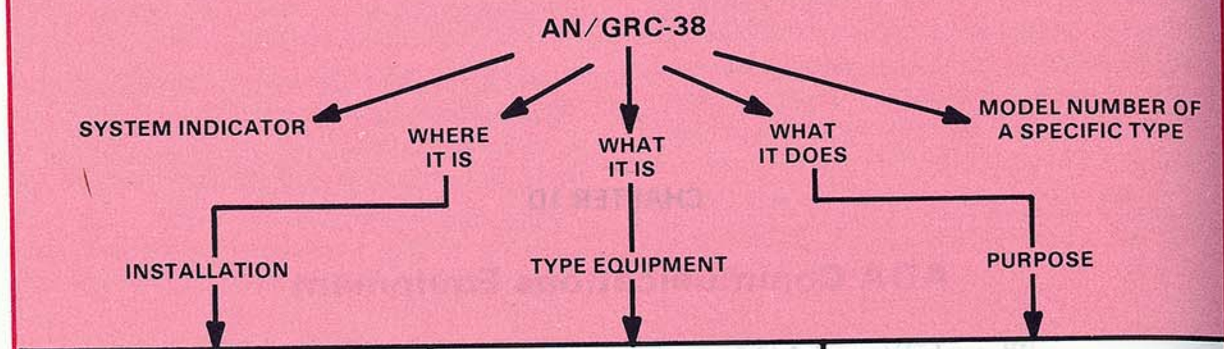
JOINT COMMUNICATIONS-ELECTRONICS EQUIPMENT DESIGNATION SYSTEMS



INSTALLATION

- A airborne installed and operated in aircraft
- B underwater mobile, submarine
- C air transportable (inactivated, do not use)
- D pilotless carrier
- F fixed
- G ground, general ground use (including two or more ground installations)
- K amphibious
- M mobile installed as operating unit in a vehicle which has no function other than transporting the equipment
- P pack or portable (animal or man)
- S water surface craft
- T ground transportable
- U general utility (includes two or more general installation classes, airborne, shipboard, and ground)
- V ground, vehicular (installed in vehicle designed for functions other than carrying electronic equipment, etc., such as tanks)
- W underwater, fixed

TYPE EQUIPMENT

- A invisible light, heat radiation
- B pigeon
- C carrier (wire)
- D radiac
- F photographic
- G telegraphic or typetype (wire)
- I interphone and public address
- K telemetering
- L countermeasures (in activated do not use)
- M meteorological
- N sound in air
- P radar
- Q sonar and underwater sound
- R radio
- S special types, magnetic, etc. or combinations of types
- T telephone (wire)
- V visual and visible light
- X facsimile or television

PURPOSE

- A auxiliary assemblies (not complete operating sets)
- B bombing
- C communications (receiving and transmitting)
- D direction finder
- G gun or searchlight directing
- H recording (photographic, meteorlogic and sound)
- J countermeasurer, receiving and transmitting
- L searchlight control (inactivated use "G")
- M Maintenance and test assemblies including tools)
- N navigational aids (including altimeters, beacons, compasses, depth sounding, approach and landing)
- P reproducing (photograph and sound)
- Q special or combination of types
- R receiving
- S detecting and/or range and bearing
- T transmitting
- W remote control
- X identification and recognition

RADIO SETS AND ANCILLARY EQUIPMENT

Three standard components combine to form eight standard configurations. The basic components include a receiver/transmitter (RT), either the RT 246/VRC or RT 524/VRC, and an auxiliary receiver R 442/VRC. In addition, all include the antenna AS-1729/VRC.

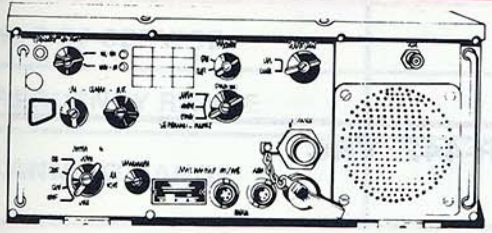
RADIO SETS AN/VRC-12-SERIES

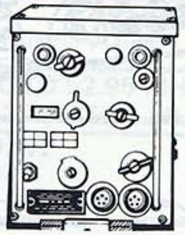
The following chart lists radio sets in the AN/VRC-12-series and the basic components of each. TM 11-5820-401-12 is a basic issue item for each radio set and provides more detailed information. The items required to mount and operate these radio sets vary, depending on the individual set and the installation in which it will be used.

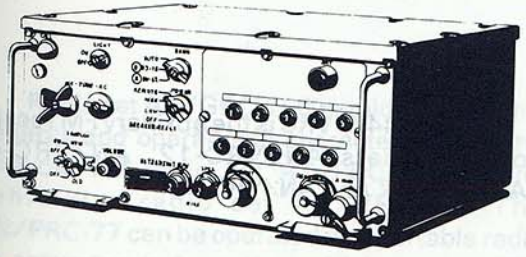
BASIC COMPONENTS OF AN/VRC-12-SERIES OF RADIO SETS

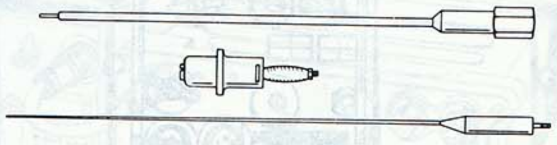
	AN/VRC-12	AN/VRC-43	AN/VRC-44	AN/VRC-45	AN/VRC-46	AN/VRC-47	AN/VRC-48	AN/VRC-49
RT-524/VRC					1	1	1	2
RT-246/VRC	1	1	1	2				
RT-442/VRC	1		2			1	2	
AS-1729/VRC	1	1	1	2	1	1	1	2

COMPONENTS OF AN/VRC-12-SERIES RADIO SETS


RECEIVER-TRANSMITTER RT-524/VRC


RADIO RECEIVER R-442/VRC

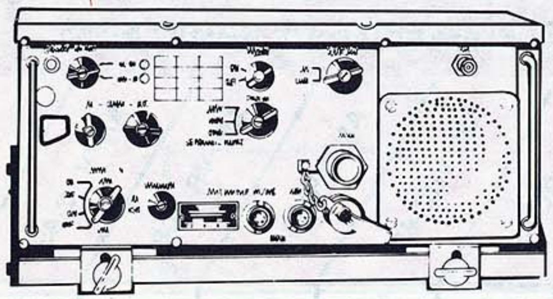

RECEIVER-TRANSMITTER RT-246/VRC


ANTENNA ASSEMBLY AS-1729/VRC

Note: The radio sets, as issued, consist only of these basic items and, as such, are not operational. The additional items of equipment required for mounting and operating the individual sets are issued separately.

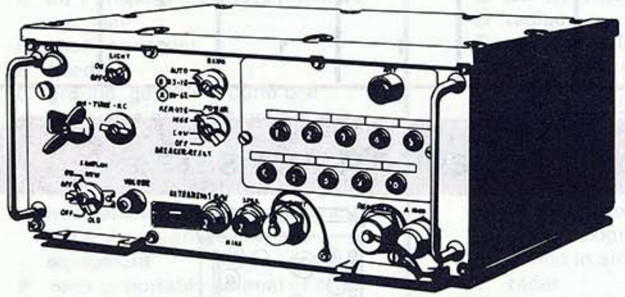
Frequency modulated (FM) radio sets in the AN/VRC-12-series are the most commonly used radios in ADA units. They are short-range sets designed for general use and may be found in a mobile or fixed configuration.

RECEIVER-TRANSMITTER RT-524/VRC



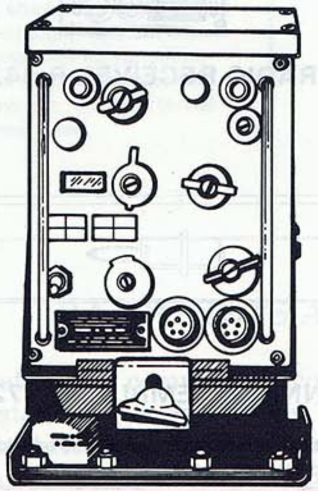
The RT-524/VRC is the receiver-transmitter used in radio sets AN/VRC-46 through -49. Both models of the RT are the same except the RT-246 has 10 automatic preset frequencies and remote channel power select capability, and the RT-524 is equipped with a built-in loud speaker.

RECEIVER-TRANSMITTER RT-246/VRC



RT-246/VRC is the RT used in radio sets AN/VRC-12 and AN/VRC-43 through -45.

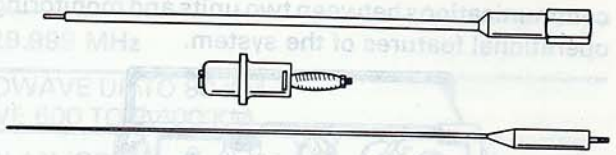
RECEIVER, RADIO R-442/VRC



The R-442/VRC is the auxiliary FM receiver of radio sets AN/VRC-12, AN/VRC-44, AN/VRC-47 and AN/VRC-48.

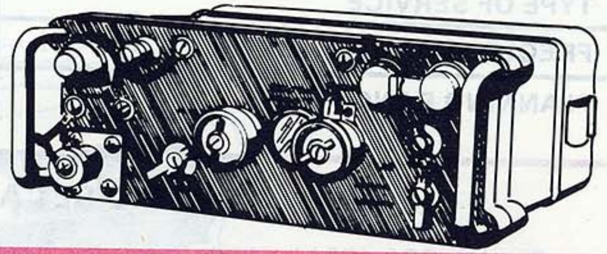
ANTENNA ASSEMBLY AS-1729/VRC

The antenna assembly AS-1729/VRC is an omni-directional whip antenna with mount. The antenna shown is for mounting on a vehicle.



RADIO SET, AN/PRC-77

Radio set AN/PRC-77 is a short-range, lightweight, frequency modulated, fully transistorized radio set. The set can be either vehicle-mounted or man-carried, and can be operated with speed security equipment.

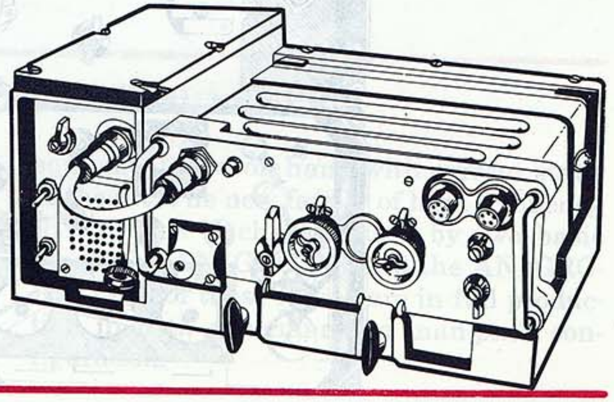


TECHNICAL CHARACTERISTICS

TYPE OF SERVICE	SINGLE CHANNEL VOICE
FREQUENCY RANGE	LOW BAND 30 TO 52.95 MHz HIGH BAND 53 TO 75.95 MHz
PLANNING RANGE	8 KM

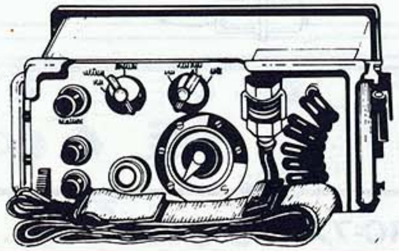
RADIO SET AN/GRC-160

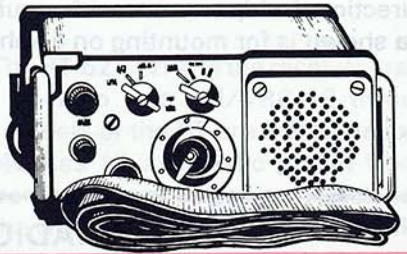
Radio set AN/GRC-160 employes the components and operational characteristics of the portable FM radio set AN/PRC-77 and the vehicular radio set AN/VRC-64. The AN/PRC-77 can be operated as a portable radio by removing it from the vehicle mount. The technical characteristics of the AN/GRC-160 are the same as the AN/PRC-77.



RADIO SET CONTROL GROUP AN/GRA-39

The AN/GRA-39 is a transistorized remote control system used to provide remote operation of FM radio sets. The set consists of a local control unit and a remote control unit. Two-way telephone communications between two units and monitoring and control of an FM radio set from either unit are operational features of the system.

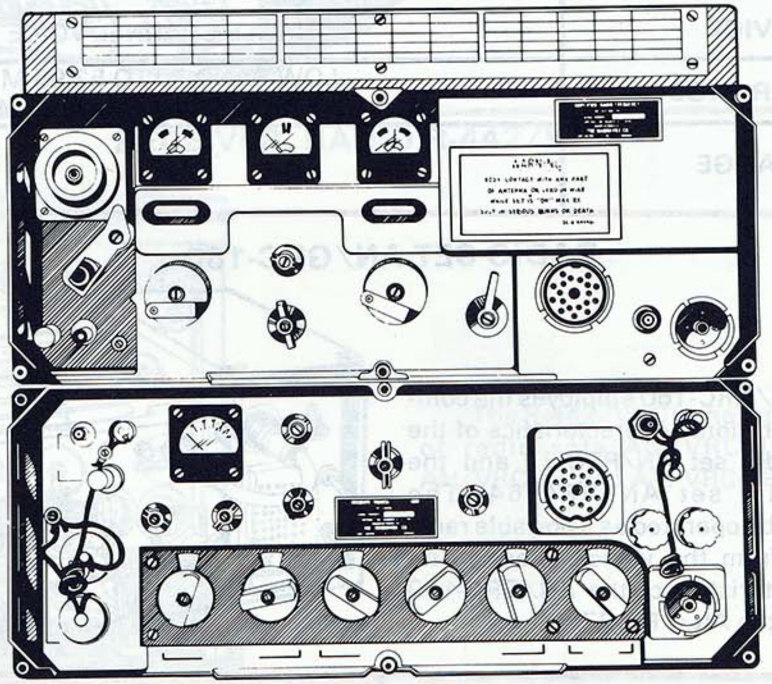




TECHNICAL CHARACTERISTICS	
TYPE OF SERVICE	VOICE
FREQUENCY RANGE (VOICE)	300-3,500 Hz
PLANNING RANGE	3.2 KM (USING FIELD WIRE WD-1/TT)

RADIO SET AN/GRA-106A

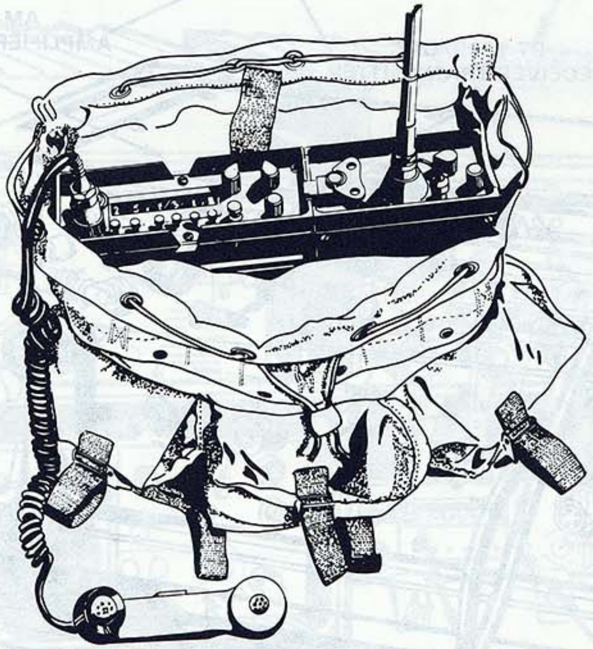
The AN/GRC-106A is a high-frequency, amplitude modulated (AM), single-sideband (SSB) radio receiving-transmitting set used primarily as a mobile link in a communications network.



TECHNICAL CHARACTERISTICS	
TYPE OF SERVICE	SINGLE CHANNEL VOICE
FREQUENCY RANGE	2.0 TO 29.999 MHz
PLANNING RANGE	GROUNDWAVE UP TO 80 KM SKYWAVE 600 TO 2,400 KM
REMOTE OPERATION	USES AN AN/GRA-6

RADIO SET AN/PRC-104

Stinger platoons use only one type of AM radio, the AN/PRC-104. The AN/PRC-104 is used to monitor early warning information. It is authorized for the Stinger platoon and section headquarters. The AN/PRC-104 is a single channel voice with a frequency range of 2.0 to 29.9-MHz.

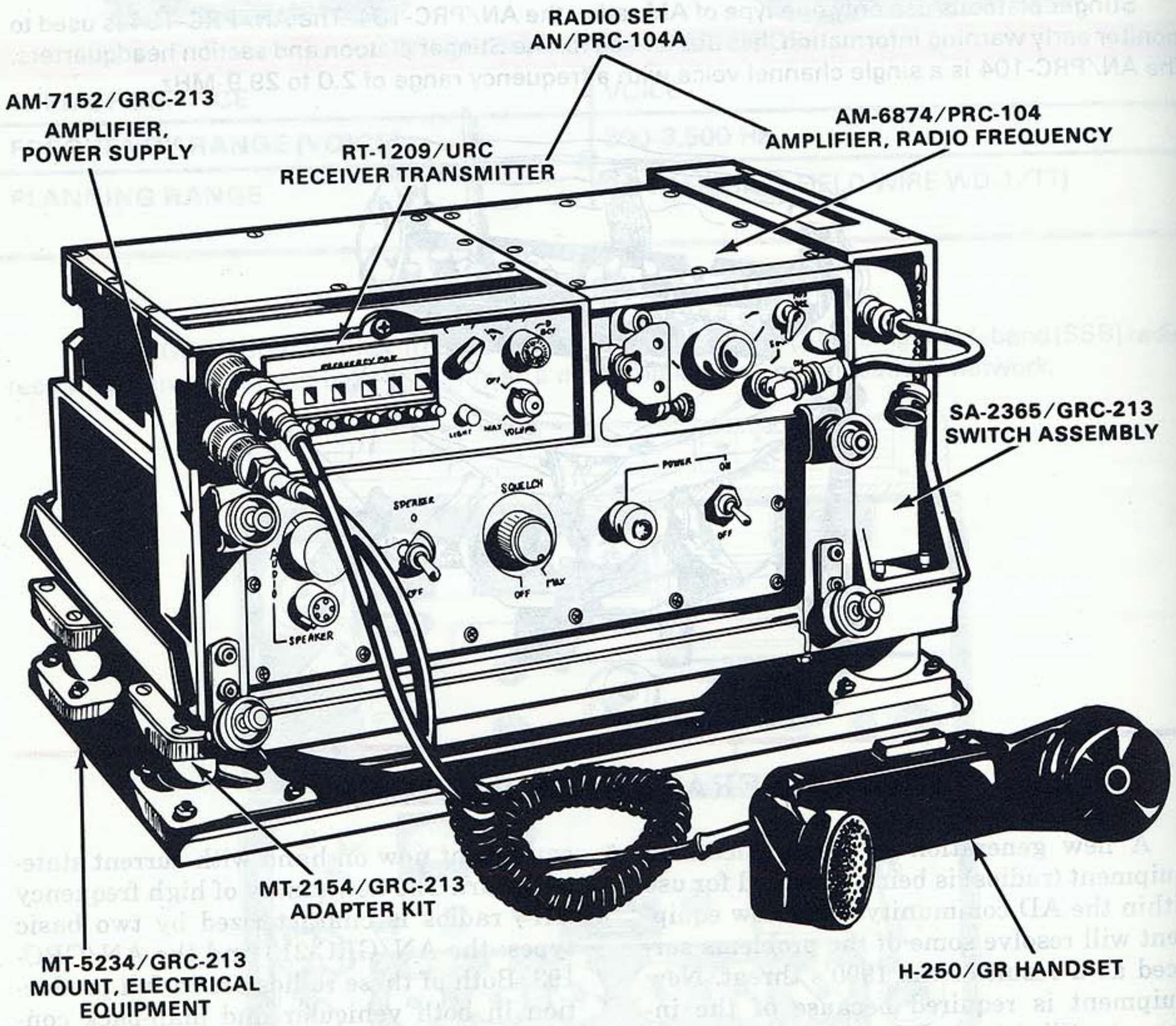


NEW GENERATION OF RADIO SETS

A new generation of communications equipment (radios) is being procured for use within the AD community. This new equipment will resolve some of the problems surfaced as a result of the 1990's threat. New equipment is required because of the increased utilization of data systems. Also, there is a need to update communications equipment now on hand with current state-of-the-art. The new family of high frequency (HF) radios is characterized by two basic types: the AN/GRC-213 and the AN/GRC-193. Both of these radios are in full production in both vehicular and man-pack configuration.

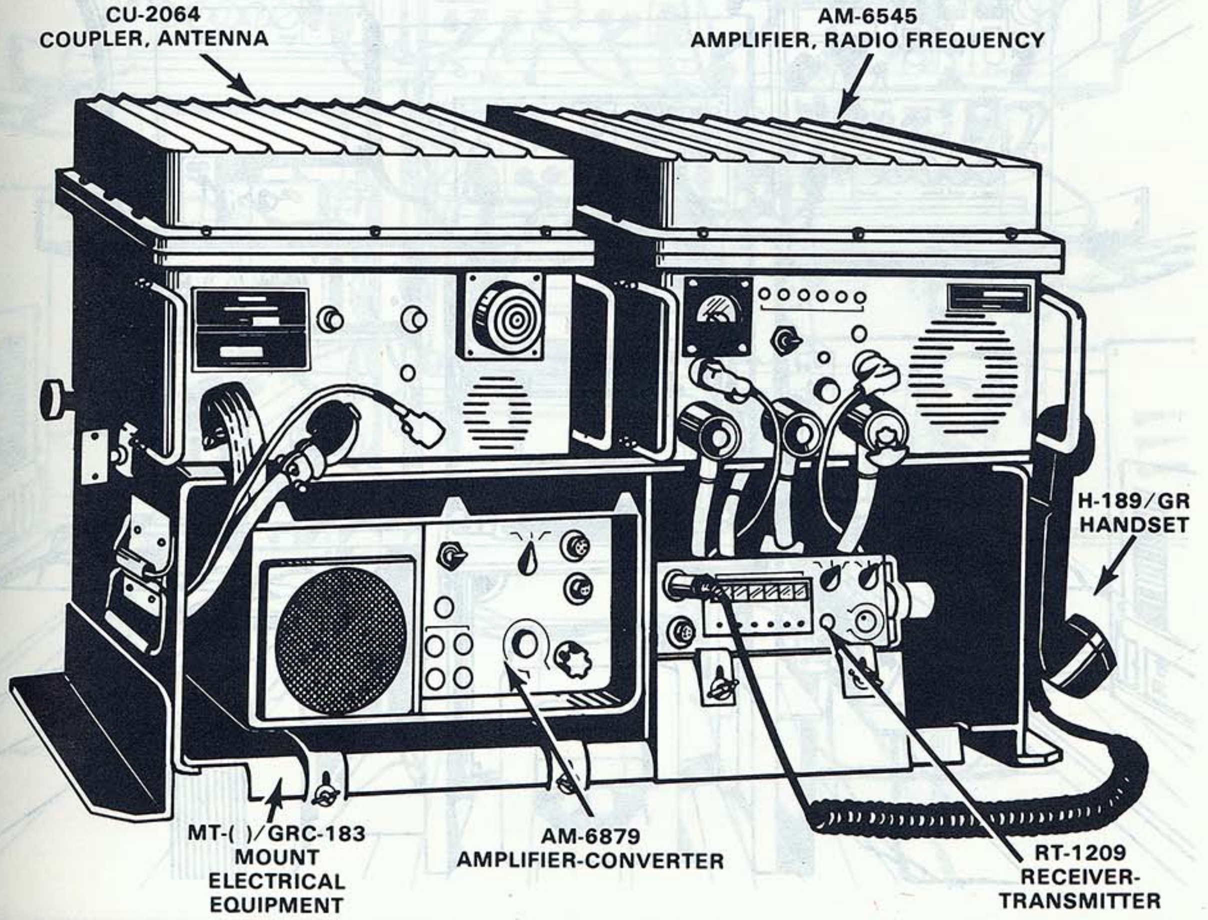
RADIO SET AN/GRC-213

The modular components of the AN/GRC-213 are separable and, for vehicular use, the receiver and audio interface amplifier module can be located within easy reach of the operator. The antenna coupler is fully automatic, requiring no manipulation during tuning or operation. When needed, an automatic antenna matching module can be mounted, along with the power amplifier/antenna coupler module, in relatively accesible locations close to the antenna feed. RF losses are thus minimized. Key features of the AN/GRC-213 are: 2- to 30-MHz frequency coverage, 20-watt power output, single sideband (SSB), and can be rapidly converted to a man pack.


RADIO SET AN/PRC-104A
AM-7152/GRC-213 AMPLIFIER, POWER SUPPLY
RT-1209/URC RECEIVER TRANSMITTER
AM-6874/PRC-104 AMPLIFIER, RADIO FREQUENCY
SA-2365/GRC-213 SWITCH ASSEMBLY
MT-2154/GRC-213 ADAPTER KIT
MT-5234/GRC-213 MOUNT, ELECTRICAL EQUIPMENT
H-250/GR HANDSET

RADIO SET AN/GRC-193

The AN/GRC-193 is a rugged 400-watt, single-sideband, tactical transceiver system. It is designed to provide reliable, long-range HF voice and data communications for both mobile and fixed stations. Its high-power transmission provides reliable communications in the most demanding environments. The system can be installed in the M15A2 standard utility vehicle or other military vehicles. The radio can be remoted up to 300 feet. Key features of the AN/GRC-193 are: long-range up to 2,500 miles, SSB voice and data, fully automatic, rugged and reliable. It will replace the AN/GRC-106. The date of delivery of the AN/GRC-193 is late FY 84.


CU-2064 COUPLER, ANTENNA
AM-6545 AMPLIFIER, RADIO FREQUENCY
H-189/GR HANDSET
MT-( )/GRC-183 MOUNT ELECTRICAL EQUIPMENT
AM-6879 AMPLIFIER-CONVERTER
RT-1209 RECEIVER-TRANSMITTER

SINCGARS

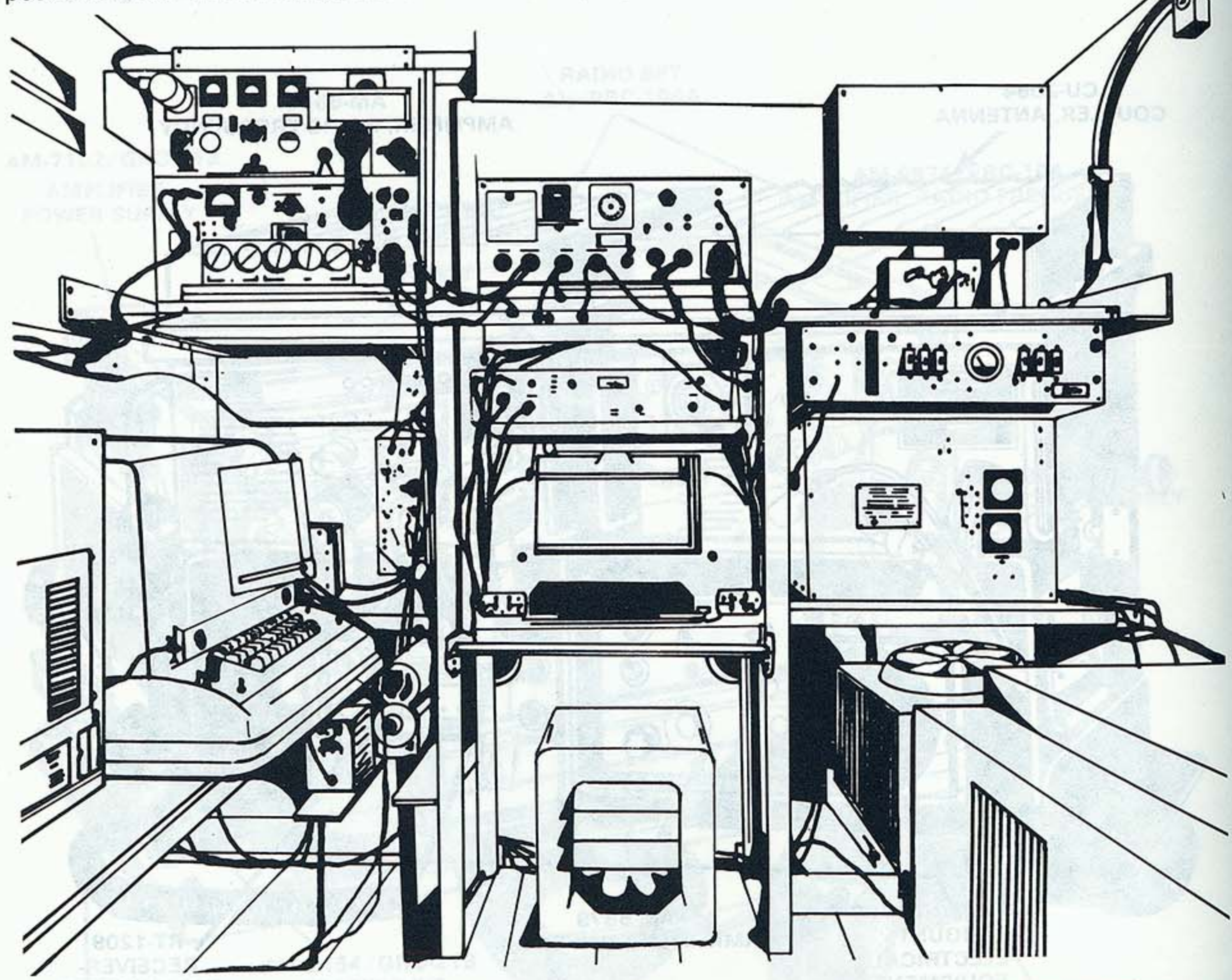
A new family of radios is under production for Army-wide use. SINCGARS (single channel ground-to-air radio system) will replace the current VRC/12-series of radios.

RADIO TELETYPE AND RELAY SYSTEMS

Radio teletypewriter and relay systems are an important part of communications. Several systems used in ADA are as described.

RADIO TELETYPEWRITER SET AN/GRC-142

The AN/GRC-142 is used primarily for radio teletypewriter operations. The modified configuration provides for long-range communications of 4,200 km. Secure radio teletypewriter operation is possible when used in conjunction with security equipment. The set is shelter mounted.

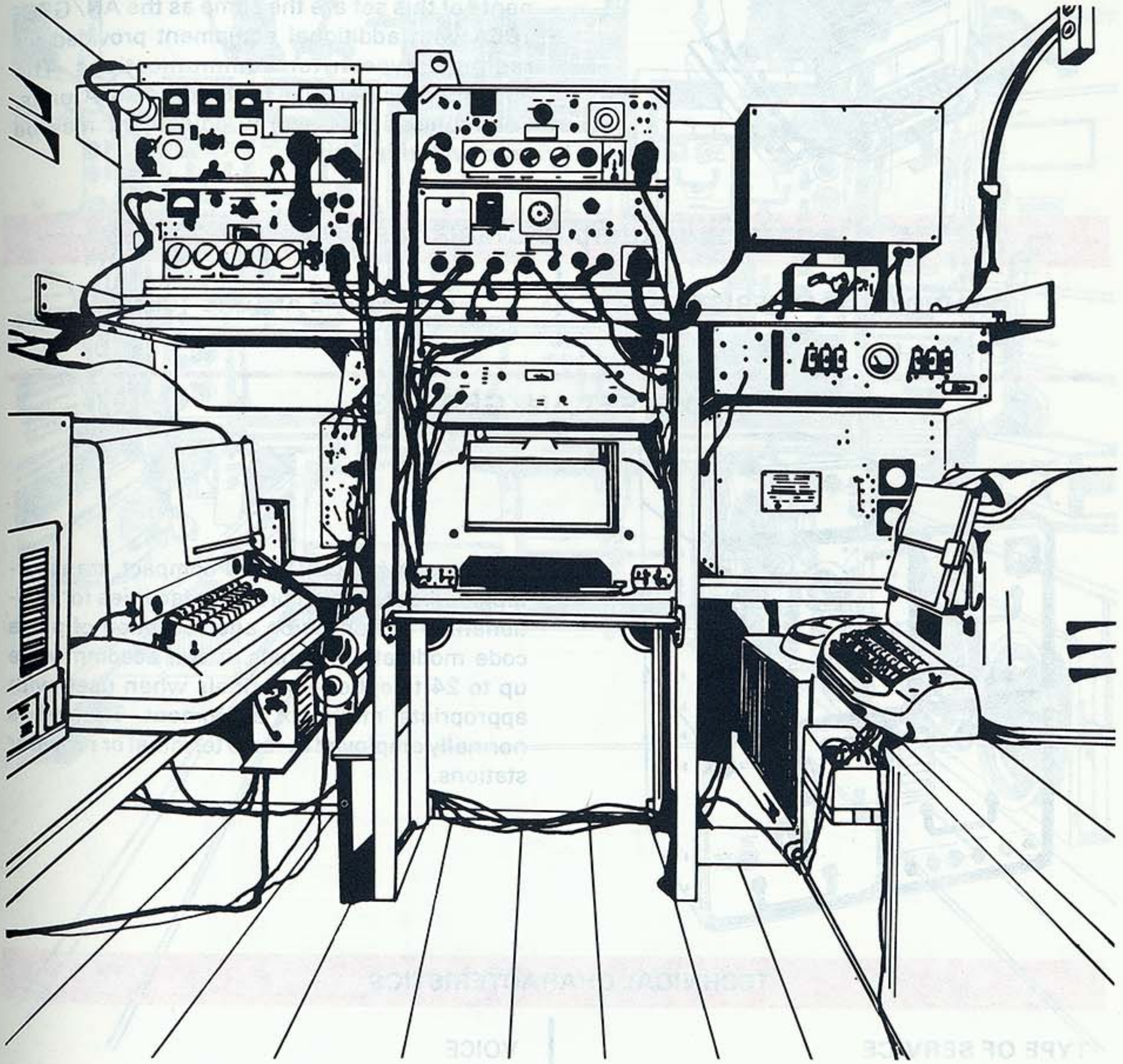


TECHNICAL CHARACTERISTICS

RADIO CHARACTERISTICS	SAME AS THE AN/GRA-106A

RADIO TELETYPEWRITER SET AN/GRC-122

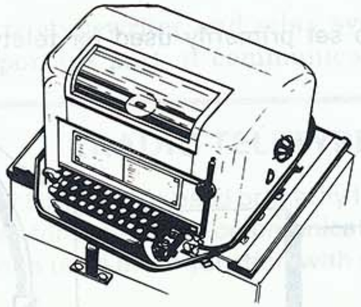
The AN/GRC-122 is a medium-power vehicular radio set primarily used for teletypewriter operations.



TECHNICAL CHARACTERISTICS

RADIO CHARACTERISTICS	SAME AS THE AN/GRA-106A

RADIO TELETYPEWRITER SET AN/VSC-2

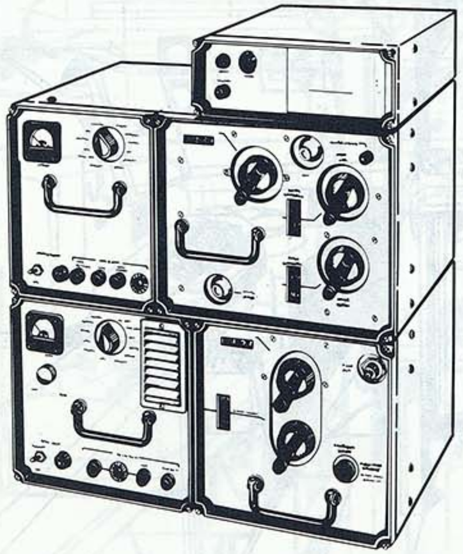


The AN/VSC-2 is vehicular-mounted and installed in a ¼-ton vehicle. The radio components of this set are the same as the AN/GRC-106A with additional equipment provided for radio teletypewriter communications. The equipment is peculiar to airborne ADA units. Communications security equipment may be used with this set.

TECHNICAL CHARACTERISTICS

RADIO CHARACTERISTICS	SAME AS THE AN/GRC-106A

RADIO SET AN/GRC-103



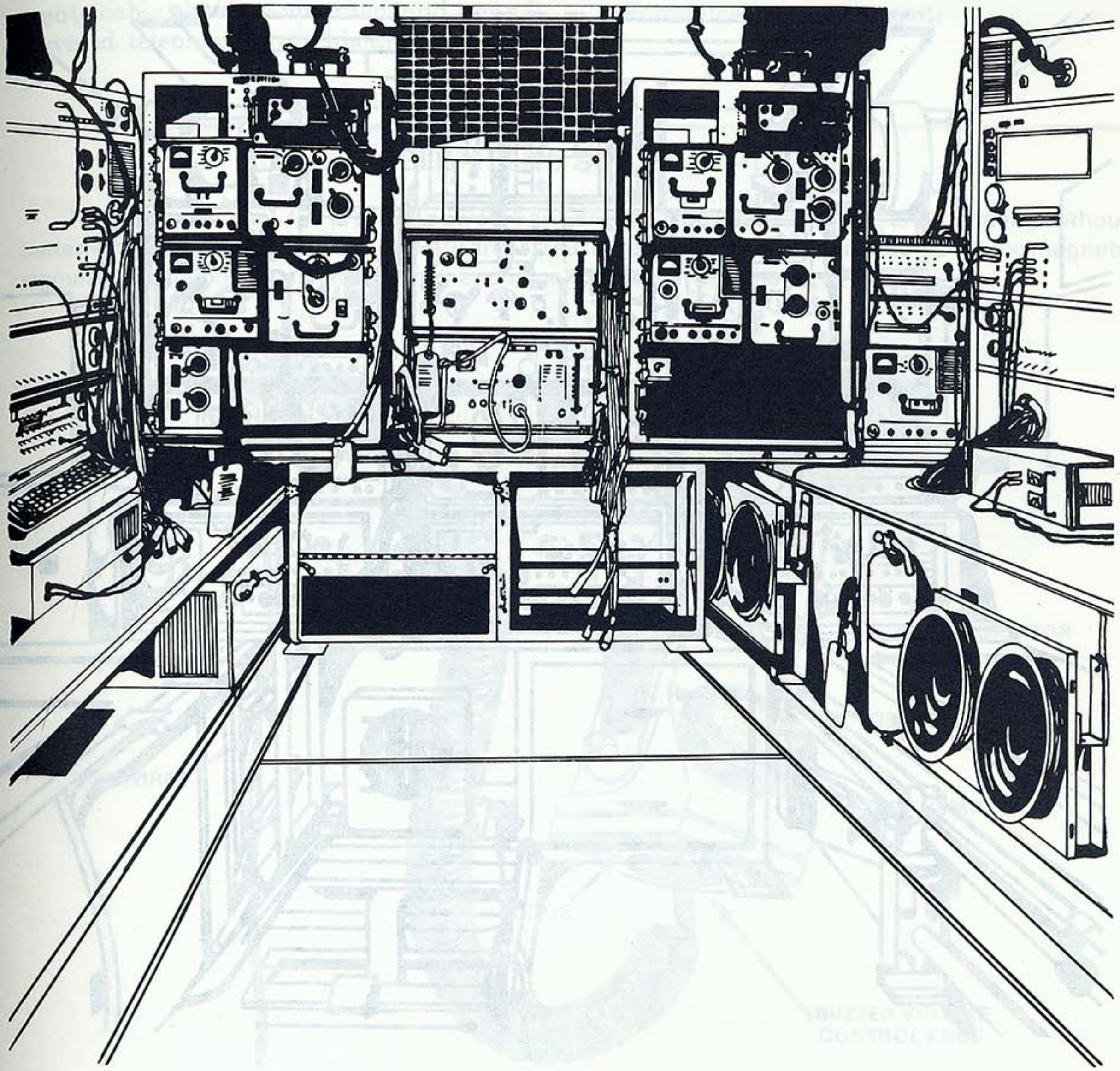
The AN/GRC-103 is a compact, transportable radio set which provides facilities for multichannel transmission and reception of pulse code modulation signals. It will accommodate up to 24 telephone channels when used with appropriate multiplex equipment. The set is normally employed in radio terminal or repeater stations.

TECHNICAL CHARACTERISTICS

TYPE OF SERVICE	VOICE
FREQUENCY RANGE	BAND I 220 - 404.5 MHz BAND II 394.5 - 705 MHz BAND III 695 - 1,000 MHz BAND IV 1,200 - 1,800 MHz
PLANNING RANGE	80 KM LINE OF SIGHT

RADIO TERMINAL SET AN/TRC-145

Radio terminal set AN/TRC-145 is a 12-channel radio terminal that provides for data link and voice communications in the ADA command and control multichannel network.

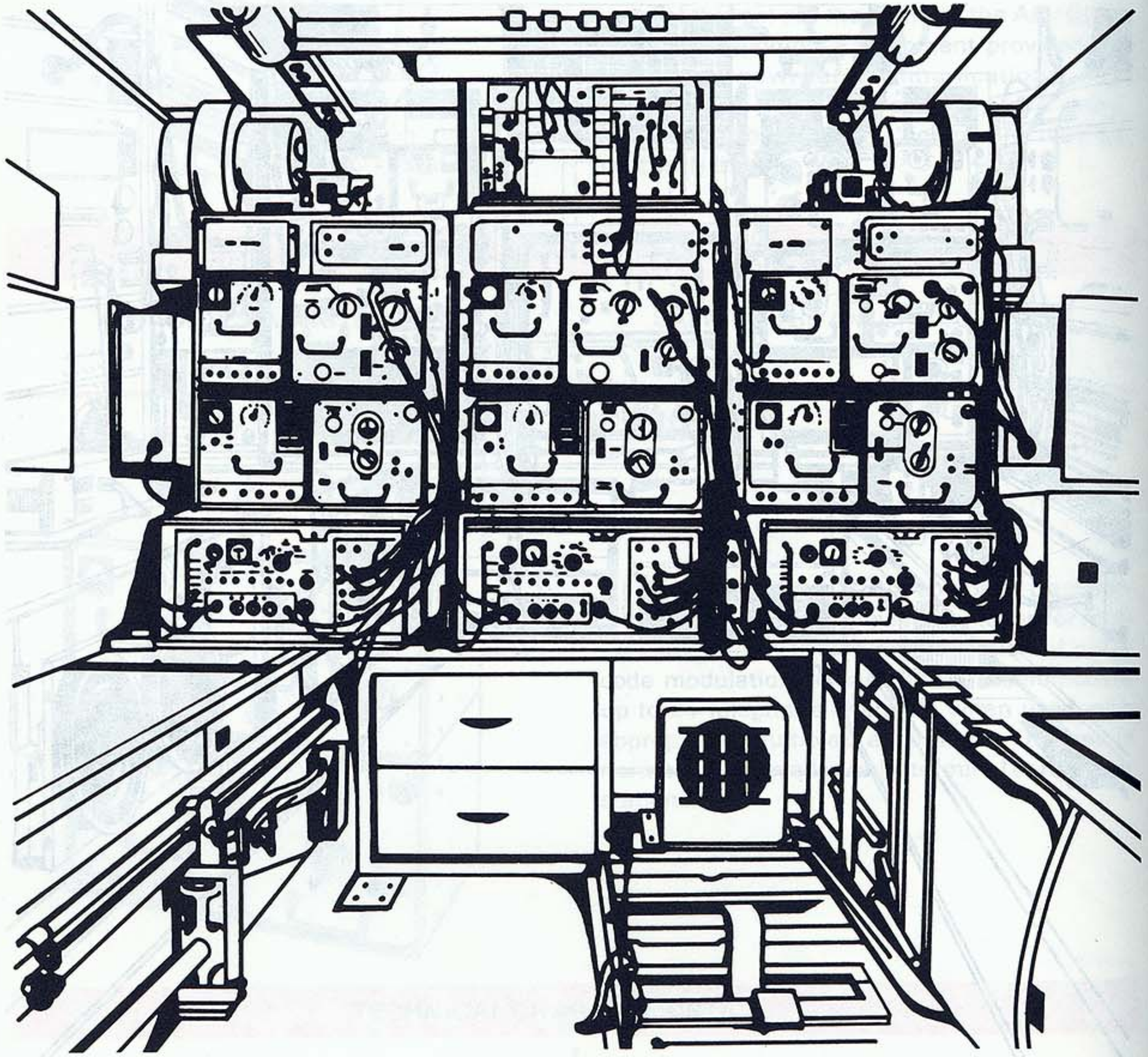


TECHNICAL CHARACTERISTICS

RADIO CHARACTERISTICS	SAME AS THE AN/GRC-103
MULTIPLE CHARACTERISTICS	12-CHANNEL VOICE

RADIO REPEATER SET AN/TRC-113

The AN/TRC-113 is a 12-channel radio repeater station used to extend the range between two radio terminal stations (AN/TRC-145).



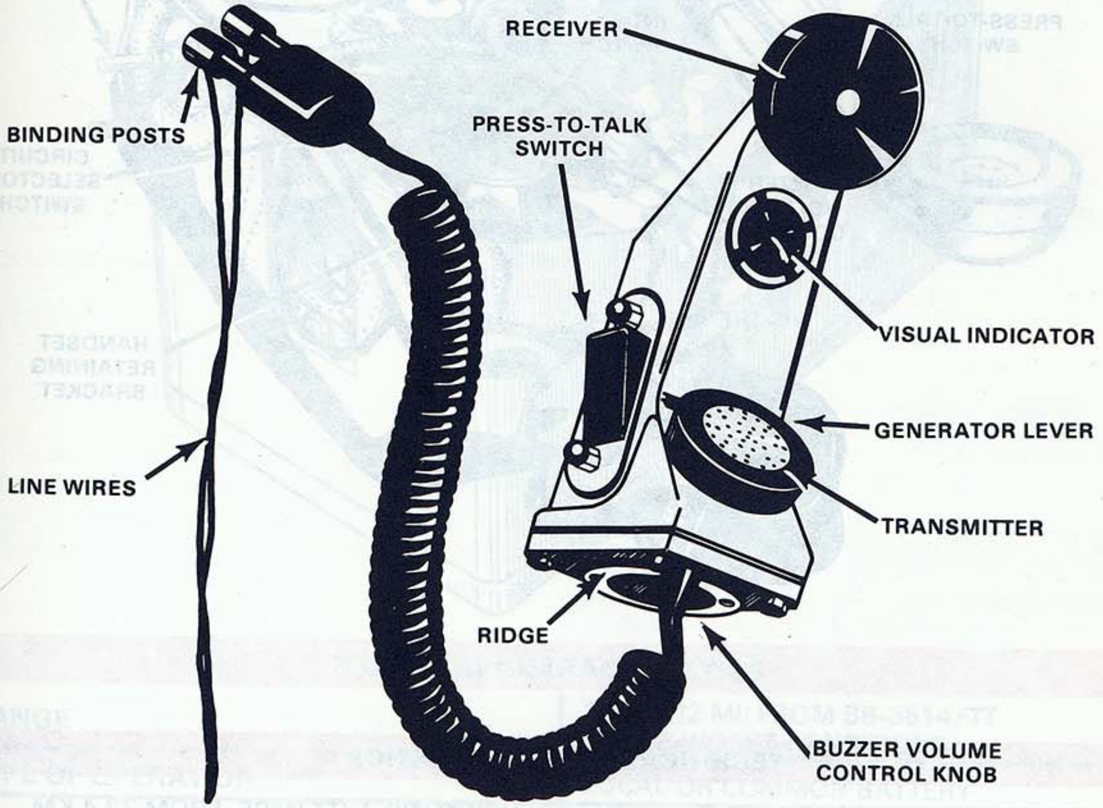
TECHNICAL CHARACTERISTICS	
RADIO CHARACTERISTICS	SAME AS THE AN/GRC-103
MULTIPLE CHARACTERISTICS	12-CHANNEL VOICE

WIRE COMMUNICATIONS EQUIPMENT

Wire is one of the most dependable means of communications. It includes the use of field wire, wire laying and recovery equipment, cable, battery-operated and sound-powered telephone, switchboards, teletypewriter, multiplexers and other associated or terminal equipment. The following information is provided on some of the ADA wire communications equipment:

TELEPHONE SET TA-1/PT

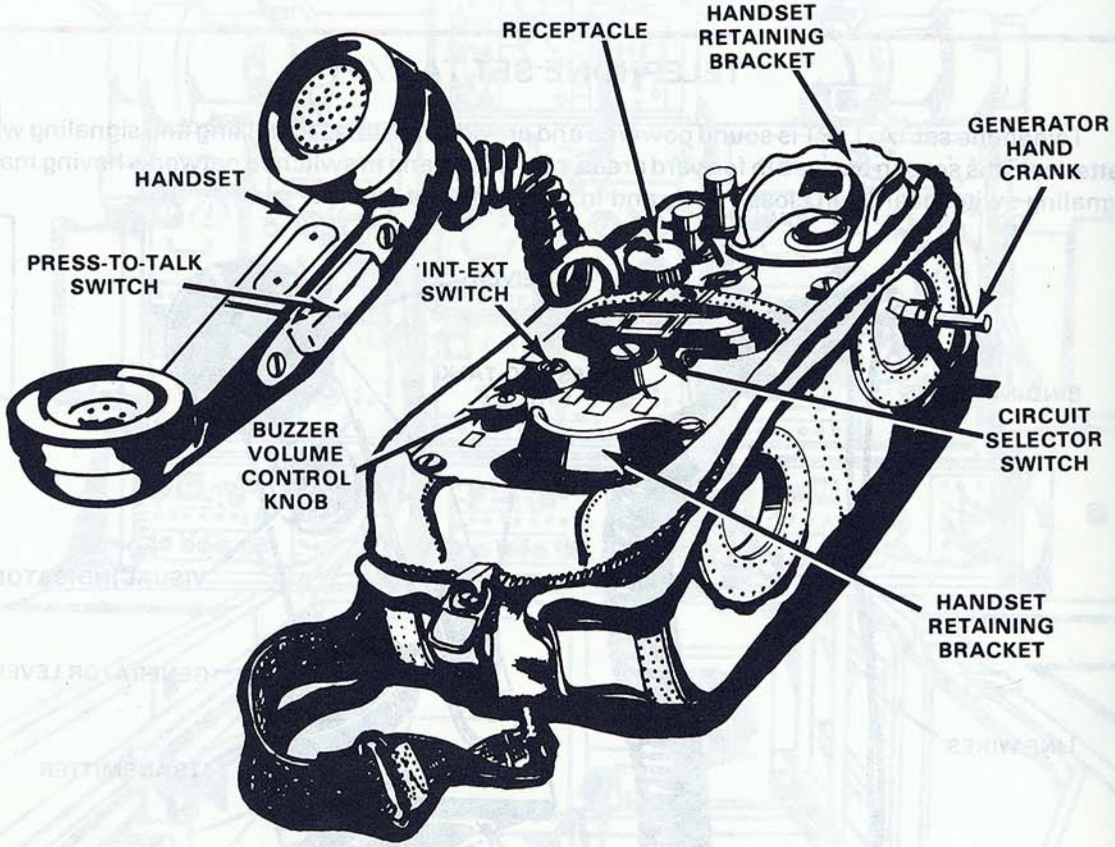
Telephone set TA-1/PT is sound powered and provides facilities for talking and signaling without batteries. This set can be used in forward areas, rear areas, and in switched networks having magneto signaling switchboards, in closed nets, and in point-to-point circuits.



TECHNICAL CHARACTERISTICS	
TALKING AND SIGNALING RANGE	9.26 TO 16 KM USING WD-1/TT WIRE
SIGNALING INDICATIONS	VISUAL OR AUDIO-VISUAL

TELEPHONE SET TA-312/PT

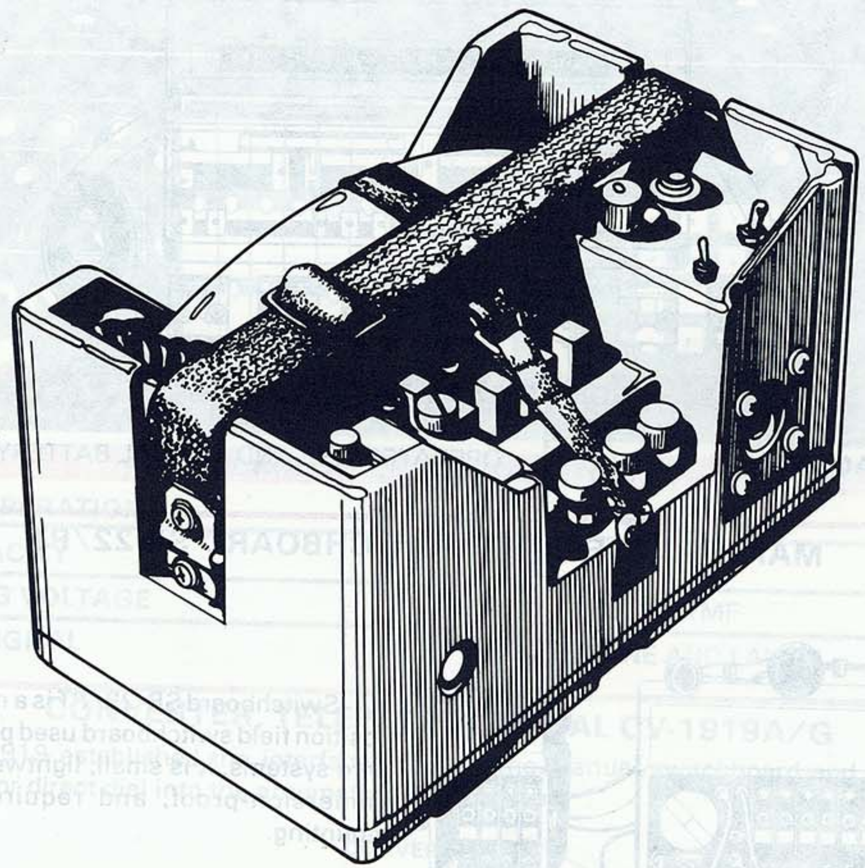
Telephone set TA-312/PT is a small, rugged, waterproof, portable field telephone designed primarily for operation in the field on a local battery system. It will also operate on a common battery system and common battery signaling system.



TECHNICAL CHARACTERISTICS	
TALKING AND SIGNALING RANGE	USING WD-1/TT WIRE, FROM 22.4 KM (WET LINES) TO 38.4 KM (DRY LINES) TYPE CONDUCTOR USED AFFECTS RANGE)
HANDSET-HEADSET USE CAPABILITY SIGNALING INDICATIONS	AUDIBLE (ADJUSTABLE)

TELEPHONE SET TA-838/TT

The TA-838/TT is a ruggedized, solid-state field telephone designed for use with the SB-3614/TT switchboard or with the AN/TTC-25 or AN/TCC-38 tactical automatic switches. It is a two- or four-wire, local or common battery set using dual-tone, multifrequency (DTMF) tones for signaling. Up to four sets can be bridged across a single four-wire line for extension service.



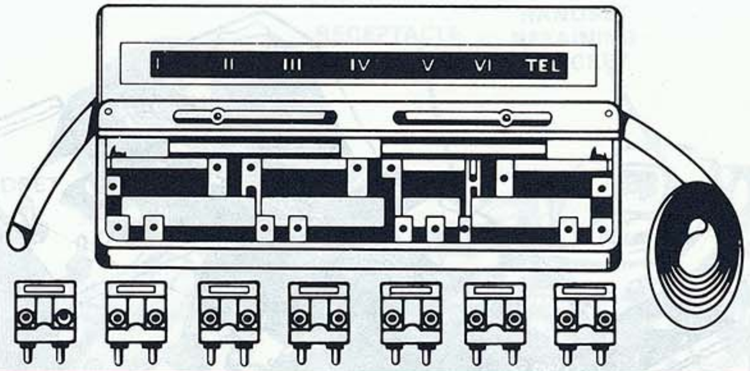
TECHNICAL CHARACTERISTICS	
RANGE	3.2 KM (2 MI) FROM SB-3614/TT UNDER WORST CONDITIONS
TYPE OF OPERATION	LOCAL OR COMMON BATTERY
SIGNALING VOLTAGE	-4 DBM (± 2 DB)
TYPE OF SIGNAL	AUDIBLE TONE
POWER REQUIREMENT	6V DC (4 EA BA-42 or BA-2042)
WEIGHT	3.6KG (8 LB)

TELEPHONE SWITCHBOARDS

Field telephone switchboards are manually operated, constructed to withstand rough handling, and designed for quick, simple installation.

TELEPHONE SWITCHBOARD SB-993/GT

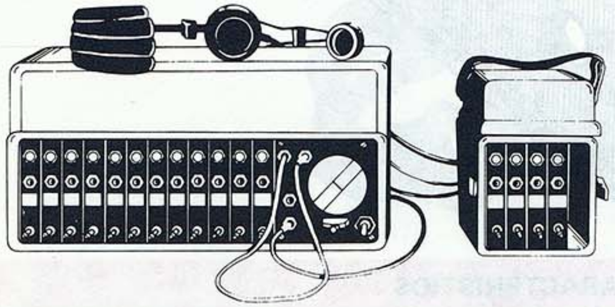
Switchboard SB-993/GT is a manual, lightweight, portable, local battery switching center normally used in company-size units.



TECHNICAL CHARACTERISTICS

LINE CAPACITY	OPERATES LINE AND 6 LOCAL BATTERY CIRCUITS

MANUAL TELEPHONE SWITCHBOARD SB-22/PT



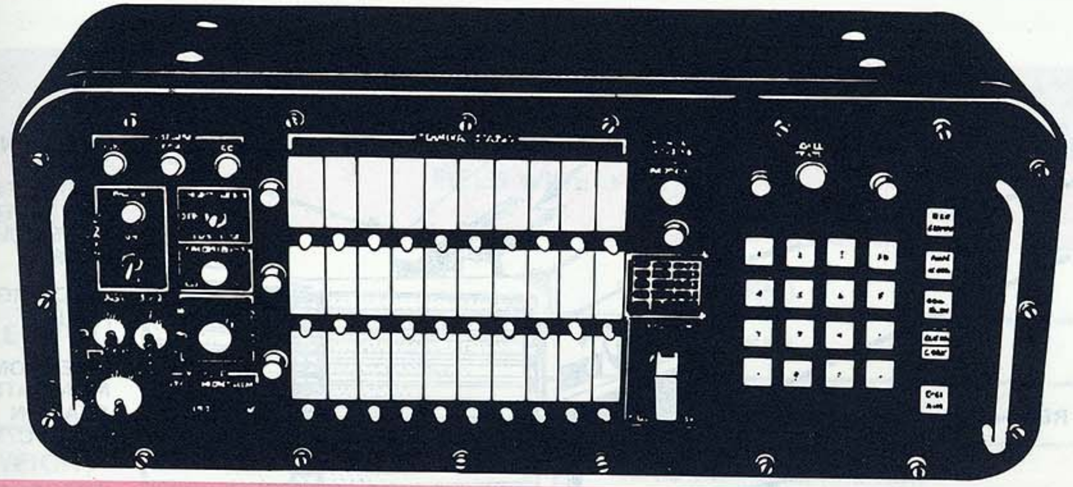
Switchboard SB-22/PT is a manual, single-position field switchboard used primarily in field wire systems. It is small, lightweight, portable, immersion-proof, and requires no special mounting.

TECHNICAL CHARACTERISTICS

LINE CAPACITY	SWITCHING EITHER 12 FIELD TELEPHONES, 12-VOICE—FREQUENCY TELETYPEWRITER CIRCUITS; 12-REMOTE-CONTROL CIRCUITS (FOR RADIO COMMUNICATIONS); OR A COMBINATION OF THESE. A CAPACITY OF 29 CIRCUITS CAN BE OBTAINED BY STACKING 2 SWITCHBOARDS.

AUTOMATIC TELEPHONE SWITCHBOARD SB-3614/TT

The SB-3614TT is an automatic modular constructed, ruggedized switchboard which provides switching of both analog and digital signals from voice, teletypewriter, and data terminal subscribers. The SB-3614/TT is capable of operation as a 30-terminal switchboard or it may be combined to operate as a 60- or a 90-terminal switchboard. It will replace the SB-86/P. The SB-3614/TT is compatible with both the older manual switchboards and the new automatic switches (such as the AN/TTC-38)

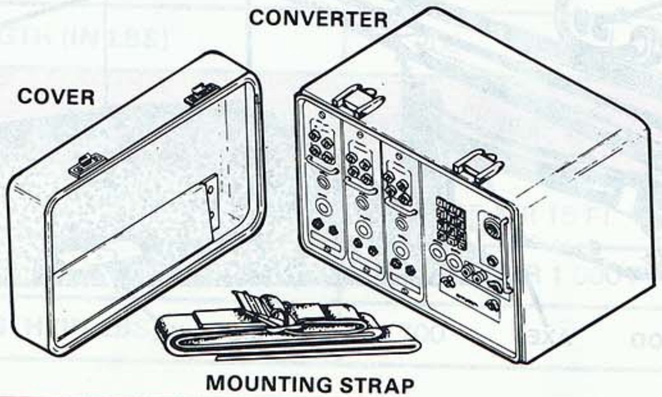


TECHNICAL CHARACTERISTICS

TYPE OF OPERATION	MANUAL OR AUTOMATIC
LINE CAPACITY	30
SIGNALING VOLTAGE	120V, 20 Hz; or DTMF
TYPE OF SIGNAL	AUDIBLE TONE AND LAMP

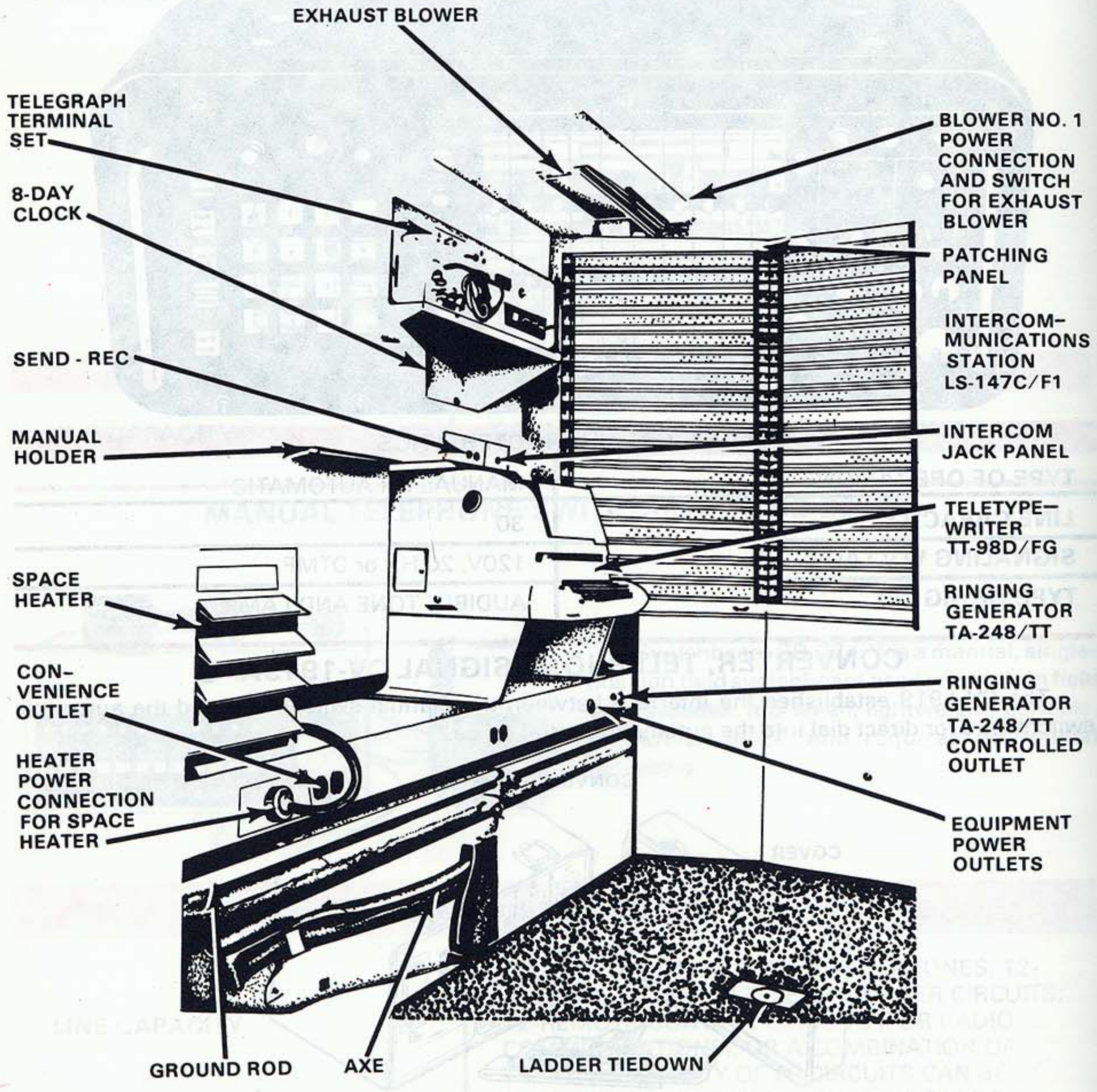
CONVERTER, TELEPHONE SIGNAL CV-1919A/G

The CV-1919 established the interface between the manual switchboard and the automatic switchboard for direct dial into the automatic central office.



AN/TSC-76 COMMUNICATIONS CENTER

The AN/TSC-76 is an air- or vehicular-transportable patching communications center used to provide an audio technical control facility for use in a division communications system. The AN/TSC-76 provides facilities for patching (routing and rerouting), testing, and monitoring telephone circuits, voice frequency (vf), and tone circuits for use with switchboard SB-22/PT. The AN/TSC-76 may be operated while mounted on a truck or on the ground.


EXHAUST BLOWER
TELEGRAPH TERMINAL SET
8-DAY CLOCK
SEND - REC
MANUAL HOLDER
SPACE HEATER
CON-VENIENCE OUTLET
HEATER POWER CONNECTION FOR SPACE HEATER
GROUND ROD
AXE
LADDER TIEDOWN
BLOWER NO. 1 POWER CONNECTION AND SWITCH FOR EXHAUST BLOWER
PATCHING PANEL
INTERCOM-MUNICATIONS STATION LS-147C/F1
INTERCOM JACK PANEL
TELETYPE-WRITER TT-98D/FG
RINGING GENERATOR TA-248/TT
RINGING GENERATOR TA-248/TT CONTROLLED OUTLET
EQUIPMENT POWER OUTLETS

FIELD WIRE AND FIELD CABLE

Field wire and cable are used in many areas of ADA communications. See the tables below for some of the important characteristics of these field wires and cables.

FIELD WIRE/CABLE CHARACTERISTICS

FIELD WIRE WD-1/TT	
LENGTH	¼ mile (.4 KM) ½ mile (.8 KM) 1 mile (1.6 KM)
WEIGHT	48 LB PER MILE (1.6 KM)
RESISTANCE	234 OHMS PER MILE
TENSILE STRENGTH (IN LBS)	200
CABLE, TELEPHONE (FOUR WIRE, FIELD WIRE) WF-16U	
LENGTH	1 MILE (1.6 KM)
WEIGHT	390 LB PER MILE (1.6 KM)
TENSILE STRENGTH (IN LBS)	200
TWENTY-SIX PAIR CABLE, CX-4566/W	
LENGTH	250.25, OR 15 FT
WEIGHT	150 LB PER 1,000 FT
TENSILE STRENGTH (IN LBS)	700

REEL UNITS

Field wire may be laid from reel units mounted in vehicles, reels or axles carried by hand, reels dispensers carried by hand and dispensers mounted in aircraft or vehicles. Two types used by ADA personnel are discussed below.

CABLE, HAND REEL RL-31-E

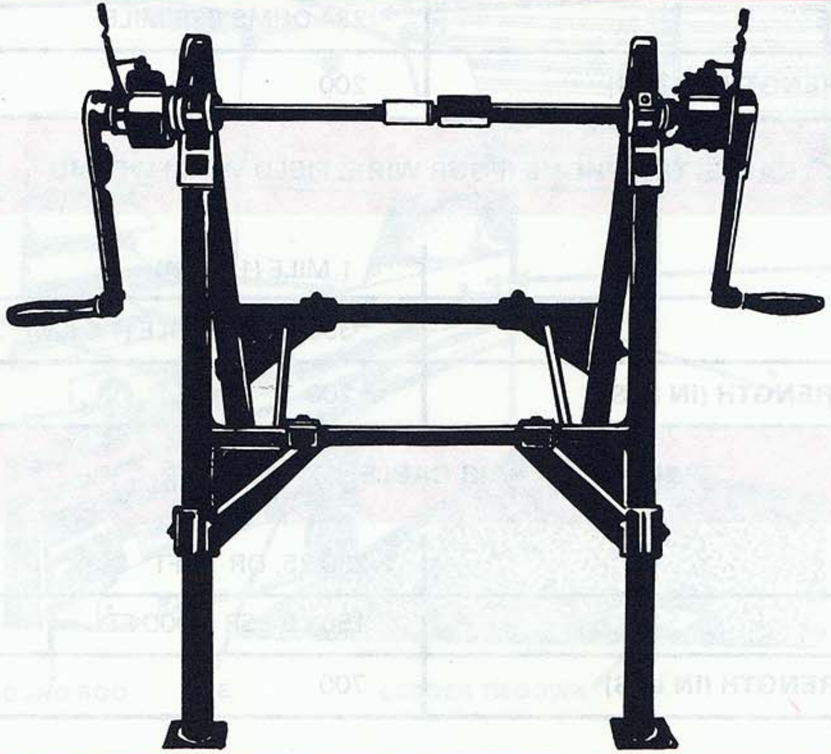
Reel unit RL-31-E is a lightweight, portable, folding A-frame of steel tubing used for paying out and recovering field wire and field cable. The reel unit has the following features:

- A brake unit for controlling the speed of the reels during payout of the wire.
- A crank for reeling in wire on reels.
- A carrying strap for carrying the reel unit litter style.
- A divided axle for use when two reels are mounted on the reel unit. This axle allows either reel to operate independently of the other. (When the divided axle is used, two cranks and two brakes are necessary for operation; they are issued with the equipment.)

The reel unit is capable of carrying a single reel DR-5 or DR-15B; or two wire reels RL-159-U. (Reel DR-15-B is used with field cable.)

Reel unit RL-31-E can be set up on the ground or mounted on a vehicle. A special vehicular installation kit is available for mounting the reel unit in a vehicle.

CABLE, HAND REEL, RL-31-E



CABLE, HAND REEL, RL-39

Reel unit RL-39 is a lightweight, portable chest-type reel consisting of an axle with carrying handles, carrying straps, and a crank for rewinding. Reel unit RL-39 mounts spool DR-8-A, which has a capacity of 0.4 km (¼ mile) of field wire WD-1/TT (wire not included as a component).

This reel is normally used to lay short local circuits, up to 0.4 km, over difficult terrain or in forward areas.

CABLE, HAND REEL, RL-39

COMMUNICATIONS SECURITY EQUIPMENT

Communications security is defined as the protection resulting from all measures designed to deny to unauthorized persons information of intelligence value which might be derived from the possession and study of telecommunications, or to mislead unauthorized persons in their interpretation of the results of such a study. Following is some of the security communications devices used in ADA.

The TSEC/KY-8, TSEC/KY-38, TSEC/KY-57, and TSEC/KY-65 with ancillary equipment are tactical, push-to-talk speech security devices designed to provide secure FM voice communications. Used within all ADA organizations, these devices greatly enhance the security and responsiveness of ADA units in tactical operations. This equipment is unclassified for external viewing, but is classified a minimum of CONFIDENTIAL for internal viewing.

The TSEC/KY-8 is designed to be mounted in a vehicle by land, sea, or air and is used with the AN/VRC-12-series radios.

The TSEC/KG-30 secure devices are used for Patriot launchers.

The TSEC/KY-38 is a speech security device used with the AN/VRC-12 and AN/PRC-77-series radios.

The TSEC/KY-57 is a half-duplex speech security device designed to be vehicle-mounted or man-portable pack and is used with the AN/VRC-12-series radios and AN/PRC-77.

The TSEC/KY-65 is a speech security device designed to be either vehicle-mounted or man-portable pack and can be used with the AN/VRC-12-series radios and the AN/PRC-77.

Note: The HYL-3/STEC digital regenerative repeater is required at a retransmission station to enable it to pass secure speech transmissions using the TSEC/KY-8 and TSEC/KY-38. It can be used with both the AN/VRC-12 and AN/PRC-77-series radios.

The TSEC/KW-7 is on-line, portable, synchronous, half-duplex, teletypewriter security equipment. It is used for securing tactical point-to-point or netted communications.

The TSEC/KG-27 is used to provide secure ADA multichannel communications circuits.

CHAPTER 11

ADA Communications Nets

To be effective when entering battle, air defense artillery units must be well-trained, employ proper tactics, have functional tactical equipment, and have responsive logistical support. To fight the battle, another requirement, communications, becomes critical. The ability of air defense units to react to the rapidly changing conditions of the modern battlefield depends on the receipt of real-time target and battle information through efficient and reliable communications.

HAWK COMMUNICATIONS

The communication nets in a Hawk battalion are designed to be highly reliable and to provide near real-time data necessary to fight the air battle. These nets are identified as intrabattalion (internal) or interbattalion (external).

INTRABATTALION NETS

Intrabattalion communications consists of radios and wire circuits necessary to support both voice and data requirements within the battalion. Intrabattalion communications consists of multichannel and single channel nets.

Multichannel Radio Nets

The multichannel nets provide the primary means of communications in the battalion. There are several standard nets as shown in illustration.

- ***Automatic data link (ADL).*** The ADL net is used to pass digital real-time air battle information such as a track information, engage commands, unit engagement status, and firing status among higher level control facilities, battalion operation centers, batteries, and platoons. There is no backup for this net.

- ***Air defense control (ADC).*** The ADC net provides for the voice exchange of tactical information not capable of being transmitted by ADL. It also serves as the primary air battle control circuit when the ADL is nonoperational or when operating in the manual mode. A high frequency/single side band (HF/SSB) net provides backup.

- ***Intelligence and radar reporting (IRR).*** The IRR net is used to pass air defense intelligence information, primarily early warning. Though the net is capable of two-way voice, it is normally used as a one-way higher to lower data flow. An HF/SSB IRR net provides backup.

CONTENTS

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HAWK COMMUNICATIONS 11-1

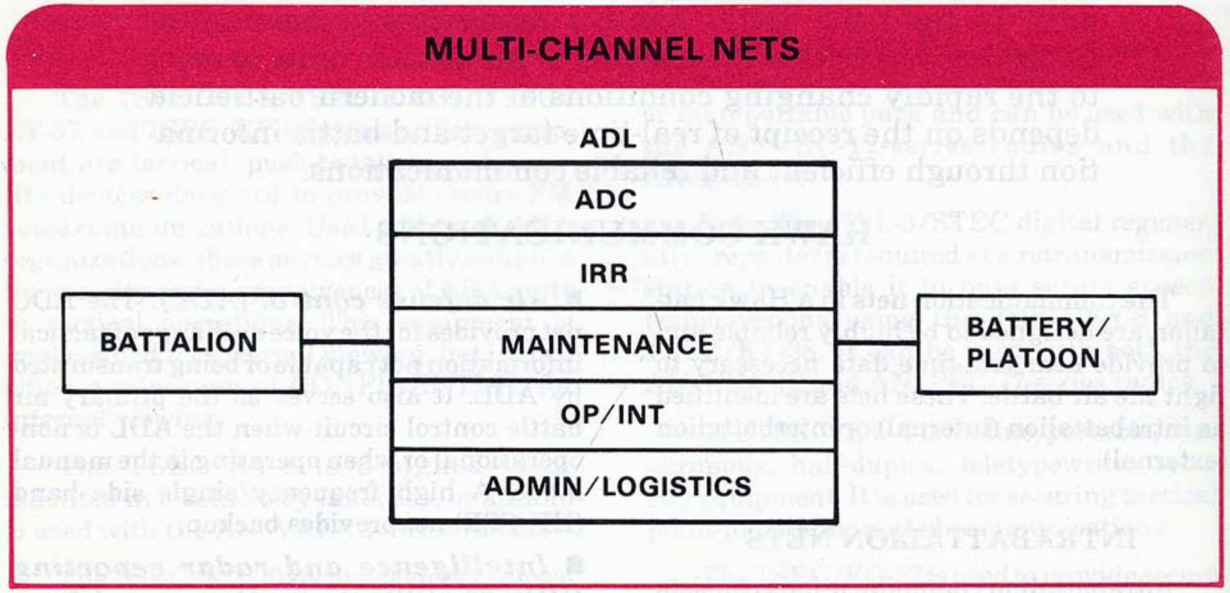
NIKE HERCULES COMMUNICATIONS 11-10

CHAPARRAL/VULCAN COMMUNICATIONS 11-12

REDEYE/STINGER COMMUNICATIONS NETS 11-21

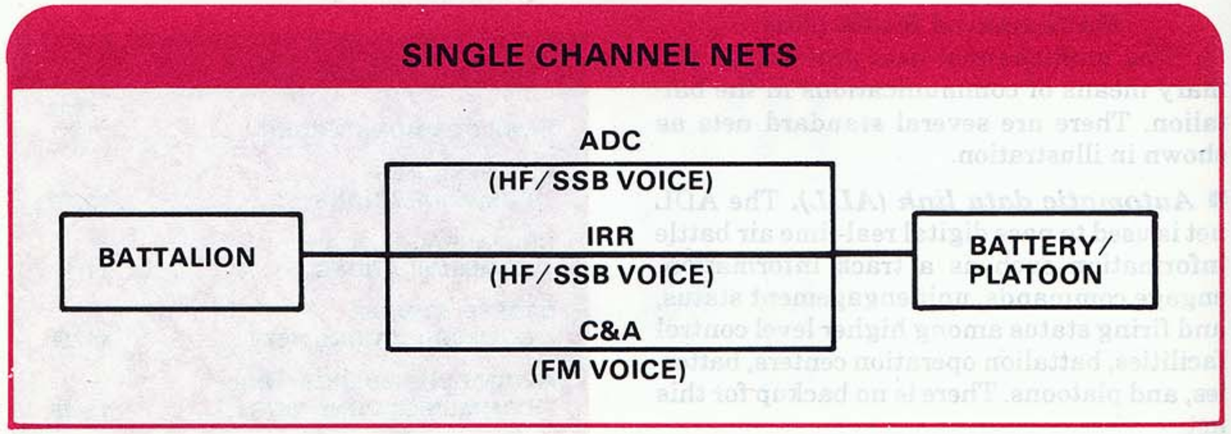
PATRIOT UHF MULTICHANNEL COMMUNICATIONS NETS 11-23

- ***Maintenance.*** The maintenance net is used by fire distribution and communications personnel to align and maintain the fire distribution system within the battalion. There is no backup net.
- ***Command.*** The command net is used to pass command and control orders among the battalion commander, battalion staff, and battery commanders. During outages or moves, an FM radio net provides backup for this net and the administrative/logistics net.
- ***Administrative/logistics.*** The administrative/logistics net is used to pass routine administrative and logistical information (that is, status of and requests for spare parts, ammunition, and rations). During outages and moves, an FM net provides backup.

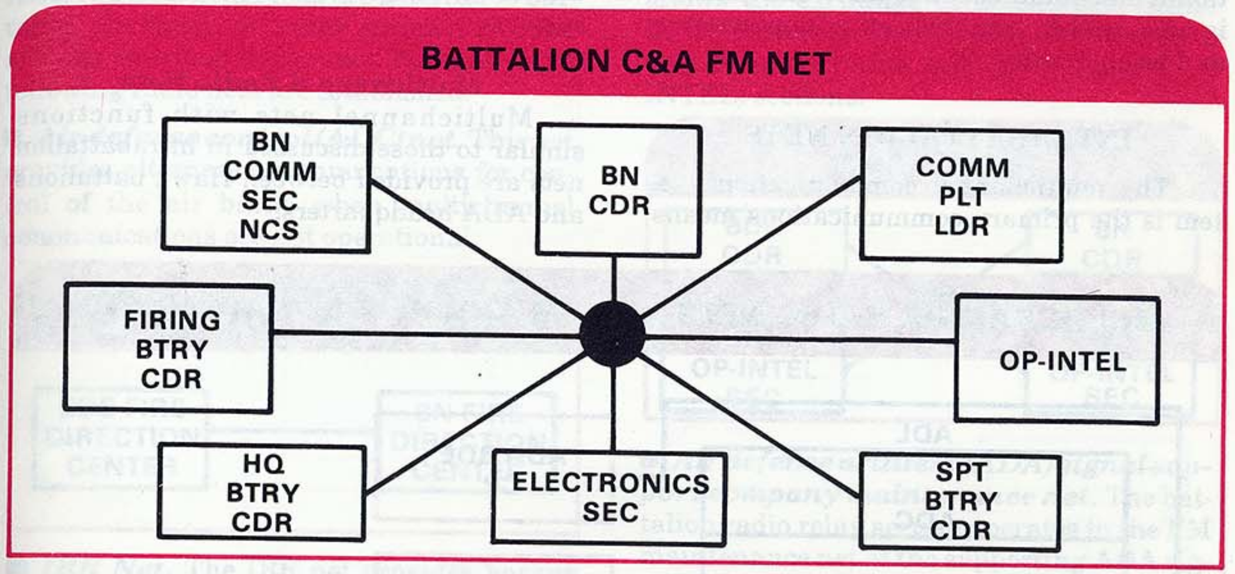

MULTI-CHANNEL NETS

Single channel radio nets

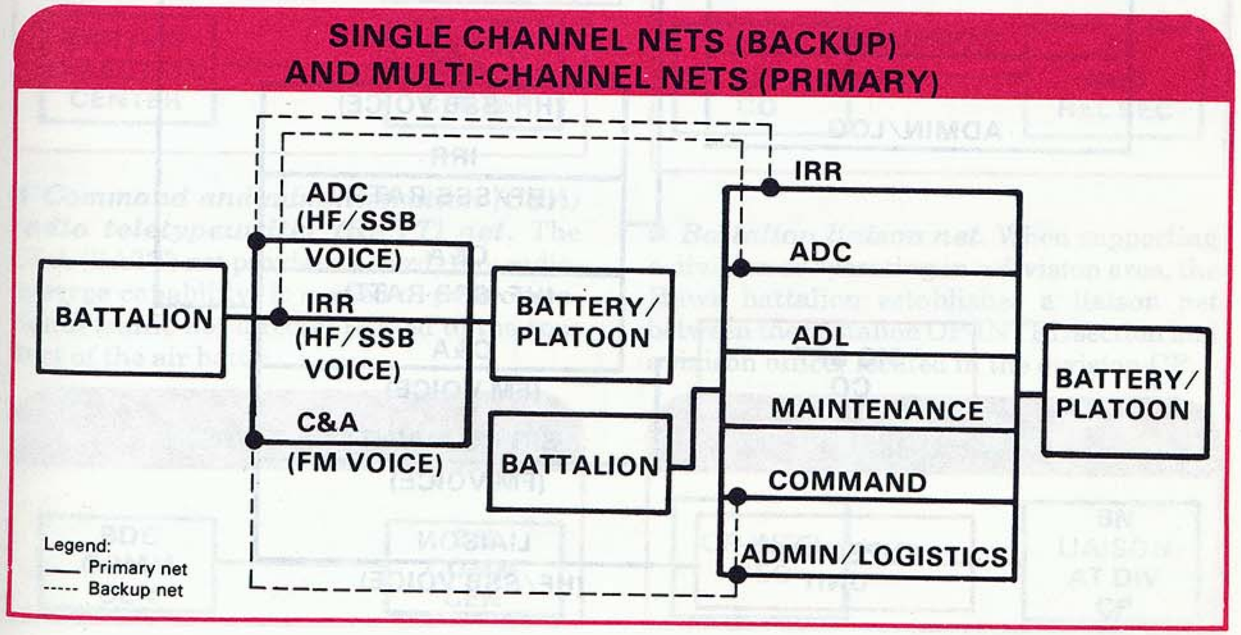
Single channel HF/SSB and FM radio nets provide alternate methods of communications when the multi-channel equipment is in a road march configuration or otherwise is inoperative.


SINGLE CHANNEL NETS

- ***Command and administrative FM net.*** The net, mentioned previously, is used as a backup for command and administrative/ logistics multi-channel nets. It is also used for command and control (other than air battle traffic) when batteries are displacing.


BATTALION C&A FM NET

- ***Air defense control (ADC) (HF/SSB) net.*** The air defense command radio net provides backup communications for the ADC multi-channel net. It assumes the functions of the ADC net in the event of a multi-channel ADC failure.
- ***IRR (HF/SSB) net.*** The intelligence radar reporting radio net provides backup communications for the IRR multi-channel net


SINGLE CHANNEL NETS (BACKUP)
AND MULTI-CHANNEL NETS (PRIMARY)

Wire Nets

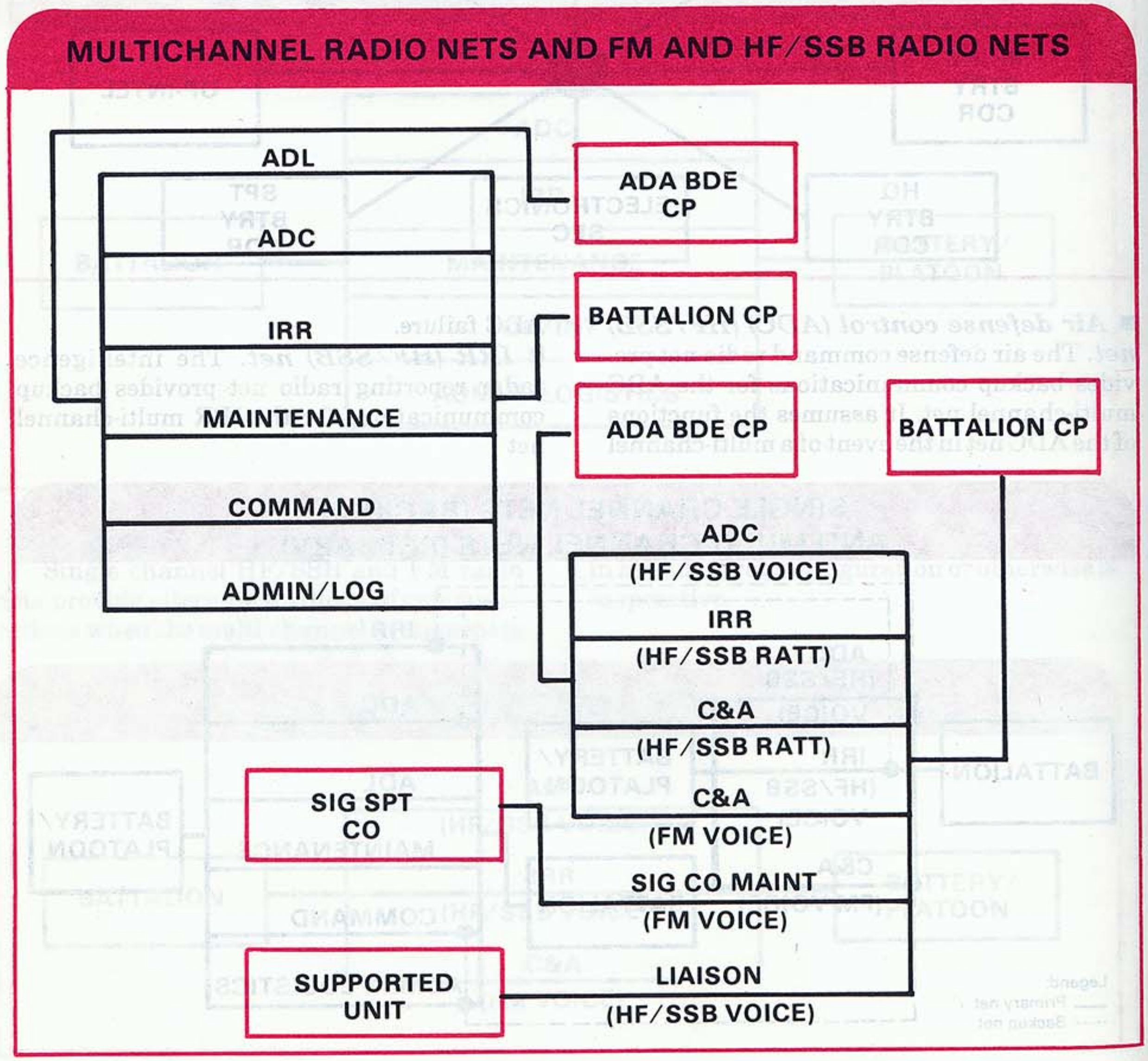
Wire is the primary means used within the battalion headquarters to pass both operational and administrative information. Wire is also used to establish an administrative and local security net.

INTERBATTALION NETS

The multichannel communication system is the primary communications means for the Hawk battalion. The multichannel system is critical to mission accomplishment. This section explains the use of some of these systems.

Multichannel Radio Nets

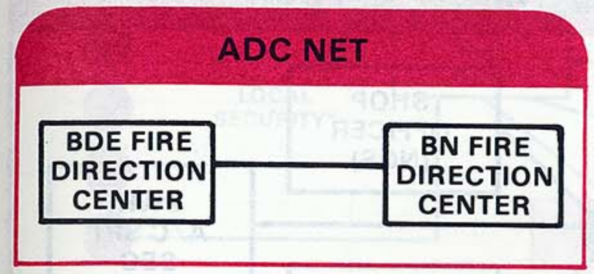
Multichannel nets with functions similar to those discussed in intrabattalion nets are provided between Hawk battalions and ADA headquarters.


MULTICHANNEL RADIO NETS AND FM AND HF/SSB RADIO NETS

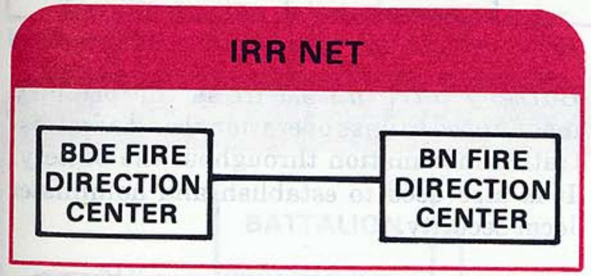
Single Channel Radio Nets

There are HF/SSB and FM radio nets used as backup for the multichannel nets. Also, two additional nets are external to battalion, the signal company maintenance net and the battalion liaison net. Normally, the following radio nets are established:

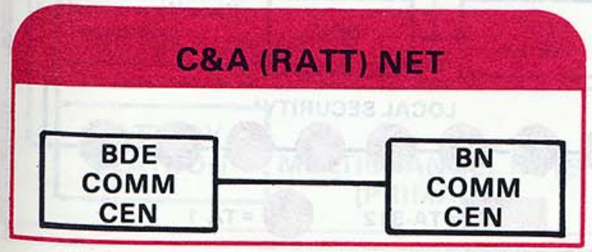
- ***Air defense control (ADC) net.*** This net provides alternate communications for control of the air battle when multichannel communications are not operational.


ADC NET

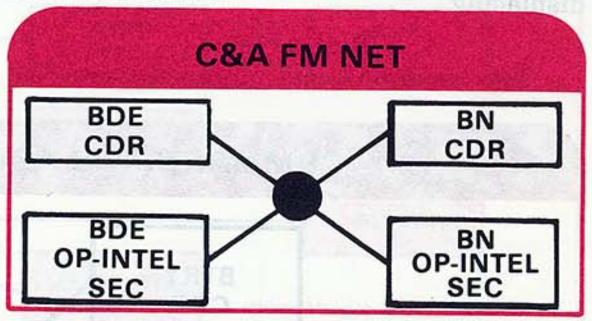
- ***IRR Net.*** The IRR net provides backup communications for early warning when multichannel communications are not operational.


IRR NET

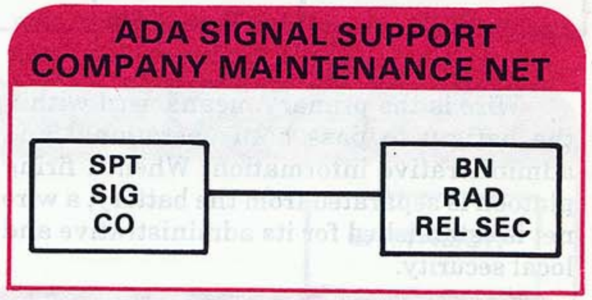
- ***Command and administration (C&A) radio teletypewriter (RATT) net.*** The C&A (RATT) net provides a hard copy radioteletype capability. It is used to pass operational traffic not directly related to the conduct of the air battle.


C&A (RATT) NET

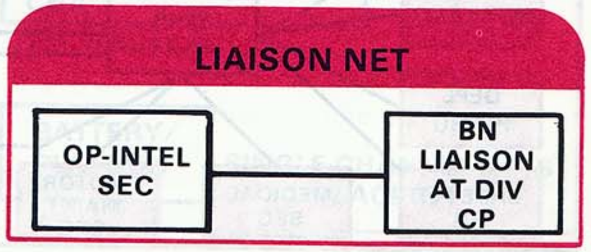
- ***Command and administration (C&A) frequency modulated (FM) net.*** This net allows the exchange of operational traffic between brigade and battalion commanders and their operation and intelligence (OP-INTEL) sections.


C&A FM NET

- ***Air defense artillery (ADA) signal support company maintenance net.*** The battalion radio relay section operates in the FM maintenance net of the supporting ADA signal company. The net is used for alignment and adjustment of the multichannel system.


ADA SIGNAL SUPPORT COMPANY MAINTENANCE NET

- ***Battalion liaison net.*** When supporting a division or operating in a division area, the Hawk battalion establishes a liaison net between the battalion OP-INTEL section and a liaison officer located in the division CP.

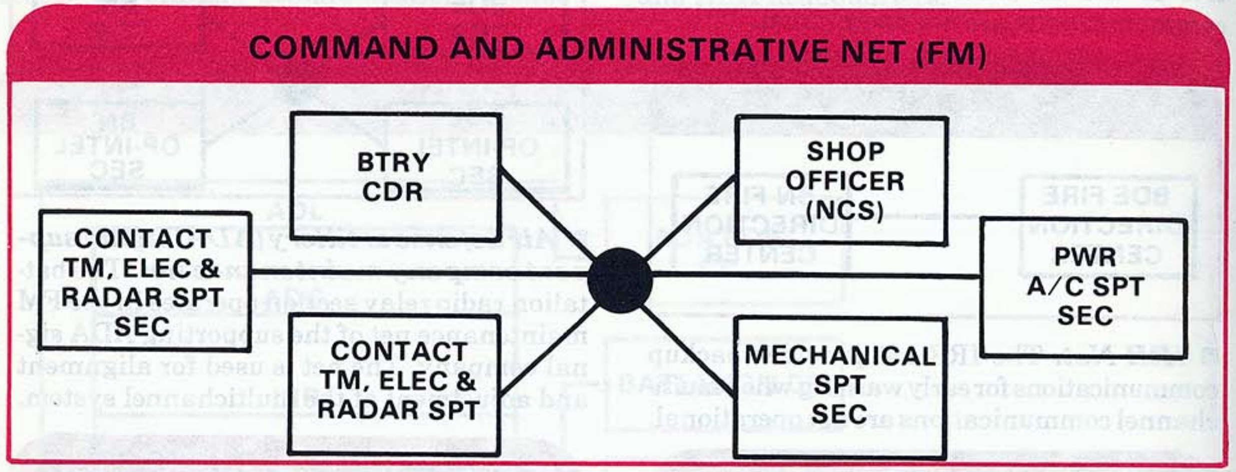

LIAISON NET

INTRABATTERY NETS

Each firing battery establishes an FM command and administrative (C&A) voice net. It provides communications when firing platoons are separated from the battery and is used to provide control when the battery is displacing.

Radio Net

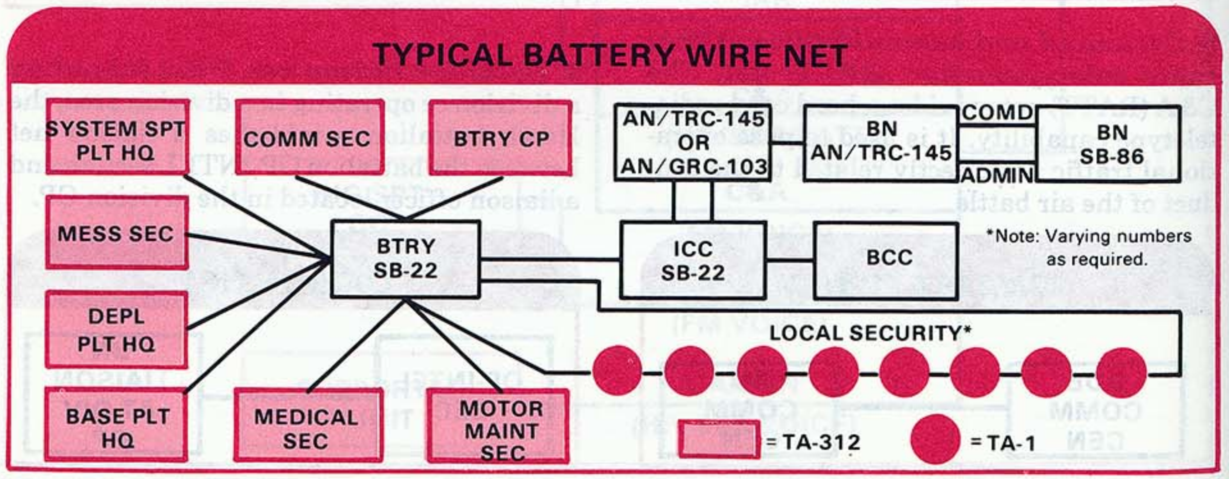
The command and administrative FM net provides communications between the battery and deployed platoons. It becomes the principal method of control between the battery command post (CP) and deployed platoons when the battery moves. When organic Redeye/Stinger teams are deployed, they use this net as their primary link to the battery.


COMMAND AND ADMINISTRATIVE NET (FM)
BTRY CDR
SHOP OFFICER (NCS)
CONTACT TM, ELEC & RADAR SPT SEC
PWR A/C SPT SEC
CONTACT TM, ELEC & RADAR SPT
MECHANICAL SPT SEC

Wire Nets

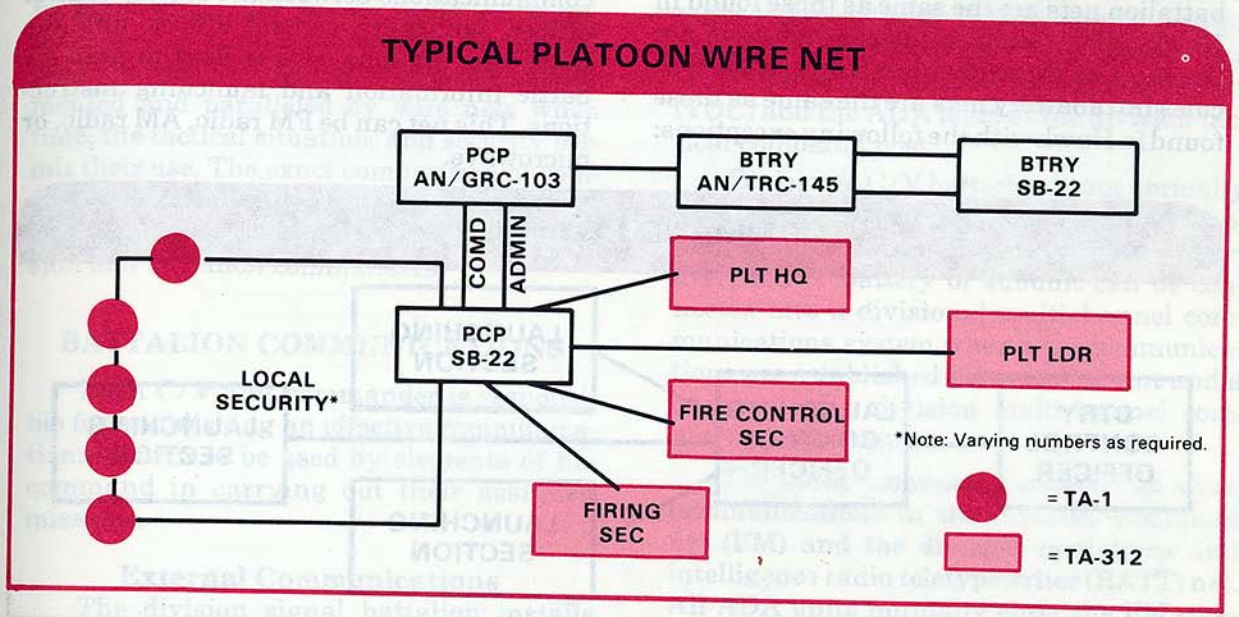
Wire is the primary means used within the battery to pass both operational and administrative information. When a firing platoon is separated from the battery, a wire net is established for its administrative and local security.

Battery wire nets. Wire is the primary means used to pass operational and administrative information throughout the battery. It is also used to establish and administer local security.


TYPICAL BATTERY WIRE NET

*Note: Varying numbers as required.

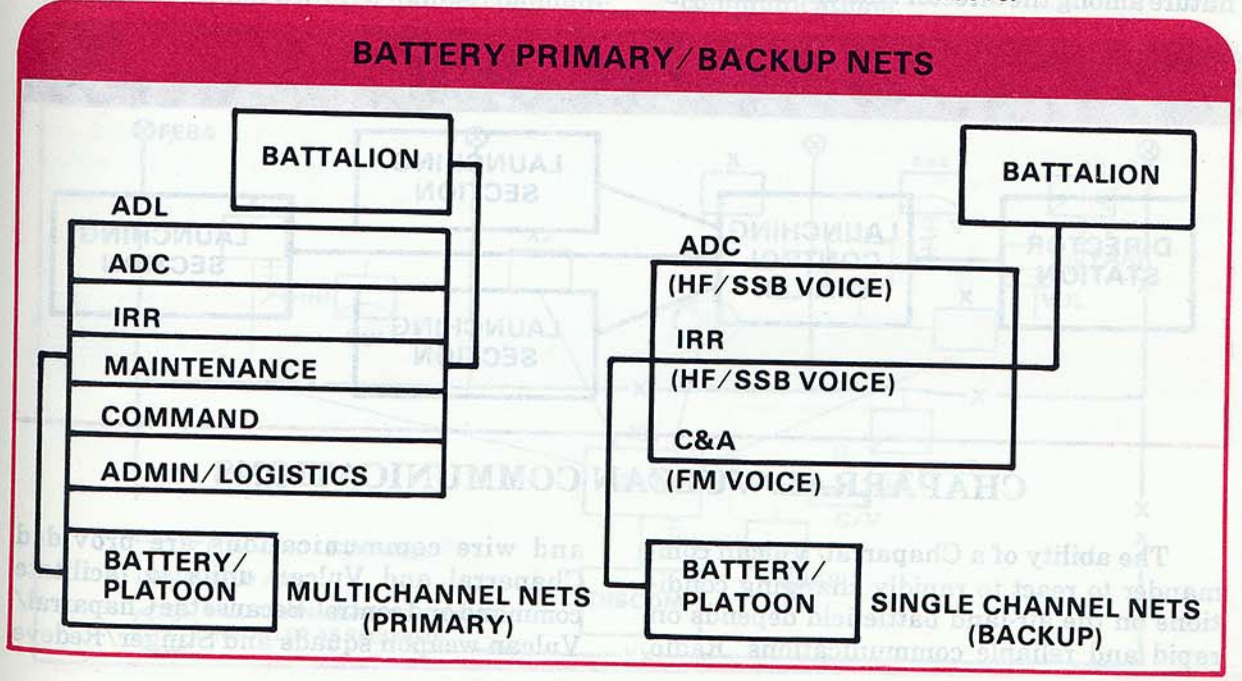
Platoon wire nets. When separated from the battery, a firing platoon must establish an administrative/local security wire net.


TYPICAL PLATOON WIRE NET

*Note: Varying numbers as required.

Interbattery Net

The illustration below shows the interbattery multichannel nets and backup radio nets used by the Hawk battery. These are the same nets described above.

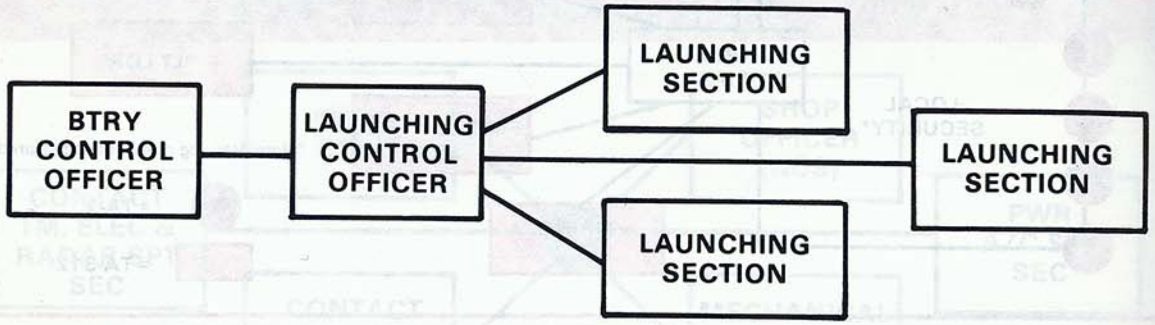

BATTERY PRIMARY/BACKUP NETS

NIKE HERCULES COMMUNICATIONS

Nike Hercules intrabattalion and interbattalion nets are the same as those found in Hawk. Nike Hercules interbattery nets are the same as those found in Hawk. Nike Hercules intrabattery nets are the same as those found in Hawk with the following exceptions:

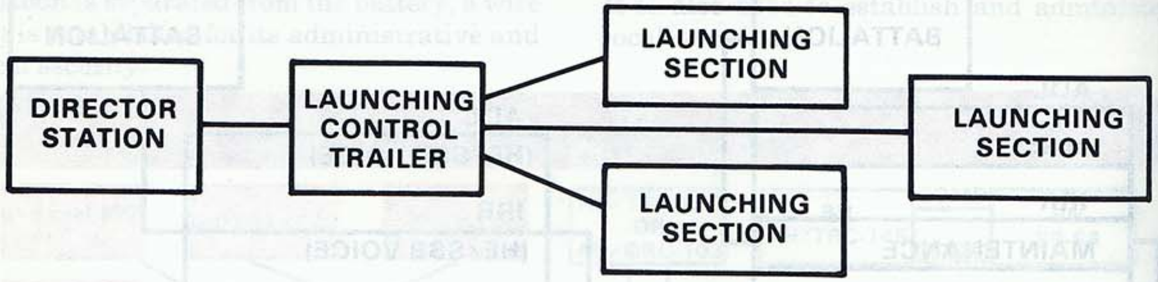
- ***Command hot loop.*** This net provides communications between the battery control officer, launching control officer, and the launching stations, and is used to pass air battle information and launching instructions. This net can be FM radio, AM radio, or microwave.

COMMAND HOT LOOP



- ***Technical hot loop.*** This net provides for the exchange of information of a technical nature among the director station, launching control trailer, and launching sections. This net can be FM radio, AM radio, or microwave.

TECHNICAL HOT LOOP



CHAPARRAL/VULCAN COMMUNICATIONS

The ability of a Chaparral/Vulcan commander to react to rapidly changing conditions on the air-land battlefield depends on rapid and reliable communications. Radio and wire communications are provided Chaparral and Vulcan units to facilitate command and control. Because the Chaparral/Vulcan weapon squads and Stinger/Redeye teams are widely dispersed and subject to frequent and rapid moves, radio is the primary means of communications during tactical operations. Radio nets must be supplemented and paralleled by wire nets when time, the tactical situation, and security permit their use. The exact composition of communications nets is directed by mission, special circumstances, and the desires of division and battalion commanders.

BATTALION COMMUNICATIONS

Each C/V unit commander is responsible for establishing an effective communications system to be used by elements of his command in carrying out their assigned missions.

External Communications

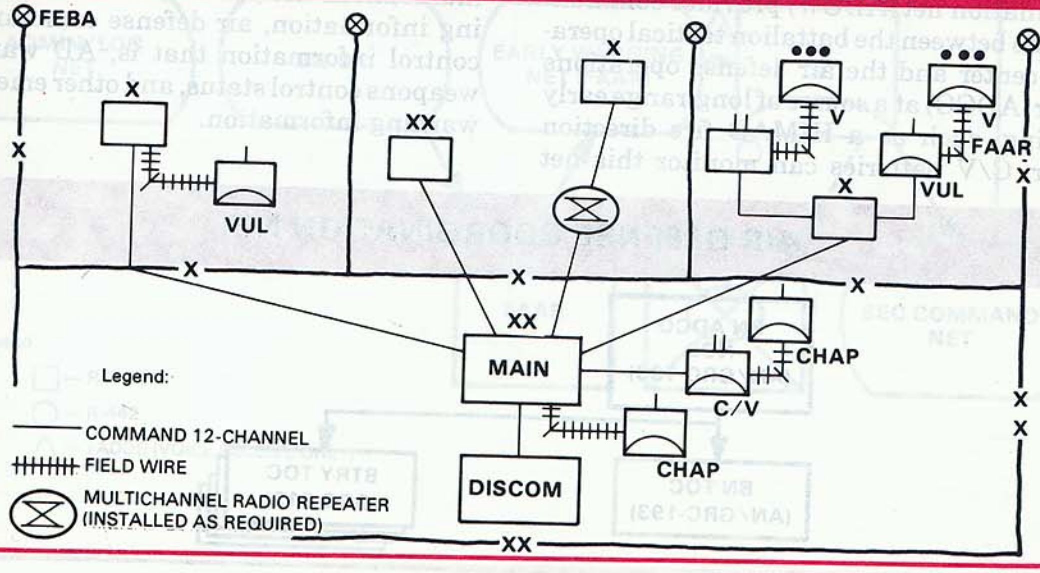
The division signal battalion installs and operates the multichannel portion of the division communications system throughout the division area of operations. This provides the C/V battalion with 12-channel communications between its TOC and the division main command post. This, in turn, allows for multichannel communications between the ADA battalion, tactical operations center (TOC) and the ADA team at the division tactical command post.

Divisional C/V batteries do not normally receive multichannel communications support from the division signal battalion. However, a C/V battery or subunit can be connected into a divisional multichannel communications system when wire communications are established between the unit and a unit receiving division multichannel communications support.

The battalion must also establish voice communications in the division command net (FM) and the division operations and intelligence radio teletypewriter (RATT) net. All ADA units normally enter the FM command nets of units they are supporting.

The following diagram shows the C/V battalion tie-in to divisional multichannel communications.

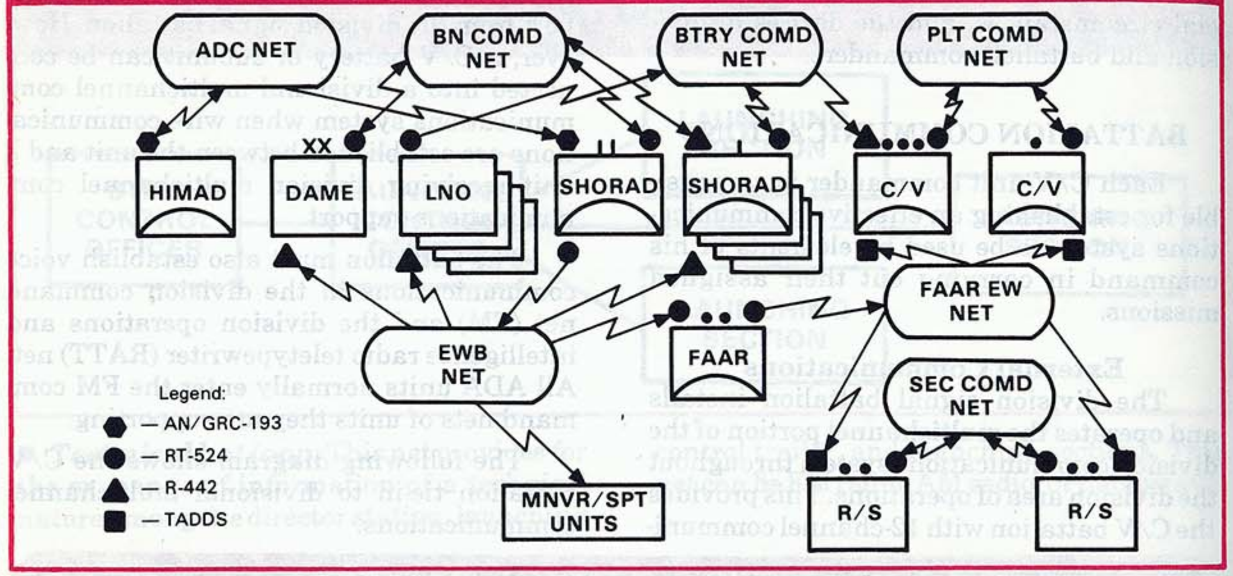
CHAPARRAL/VULCAN TIE-IN TO DIVISION MULTICHANNEL COMMUNICATIONS SYSTEM



Internal Communications

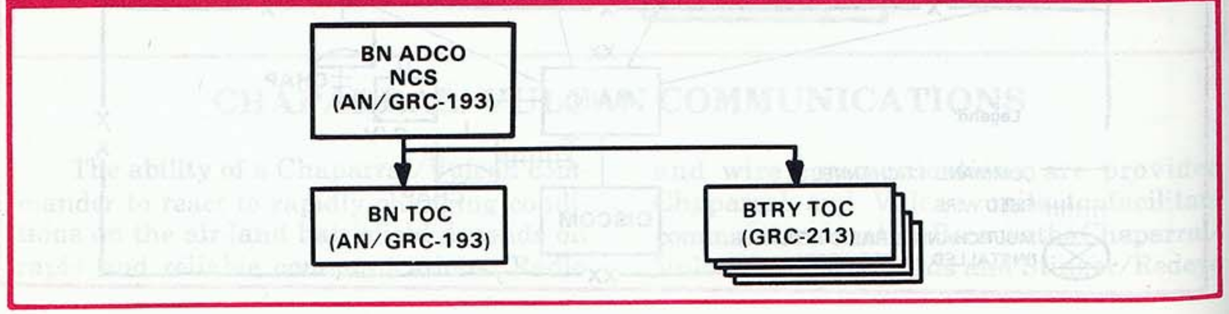
The majority of radios within the divisional C/V battalion belong to the AN/VRC-12 family of very high frequency (VHF) FM radios. These include the AN/VRC-46 (transmitter/receiver), AN/VRC-47 (transmitter/two receivers), and AN/VRC-48 (transmitter/three receivers). These radios are used in unit command nets, early warning nets, etcetera. Amplitude modulated (AM) voice radios are used for passing long-range early warning within the battalion.

C/V BATTALION INTERNAL NET



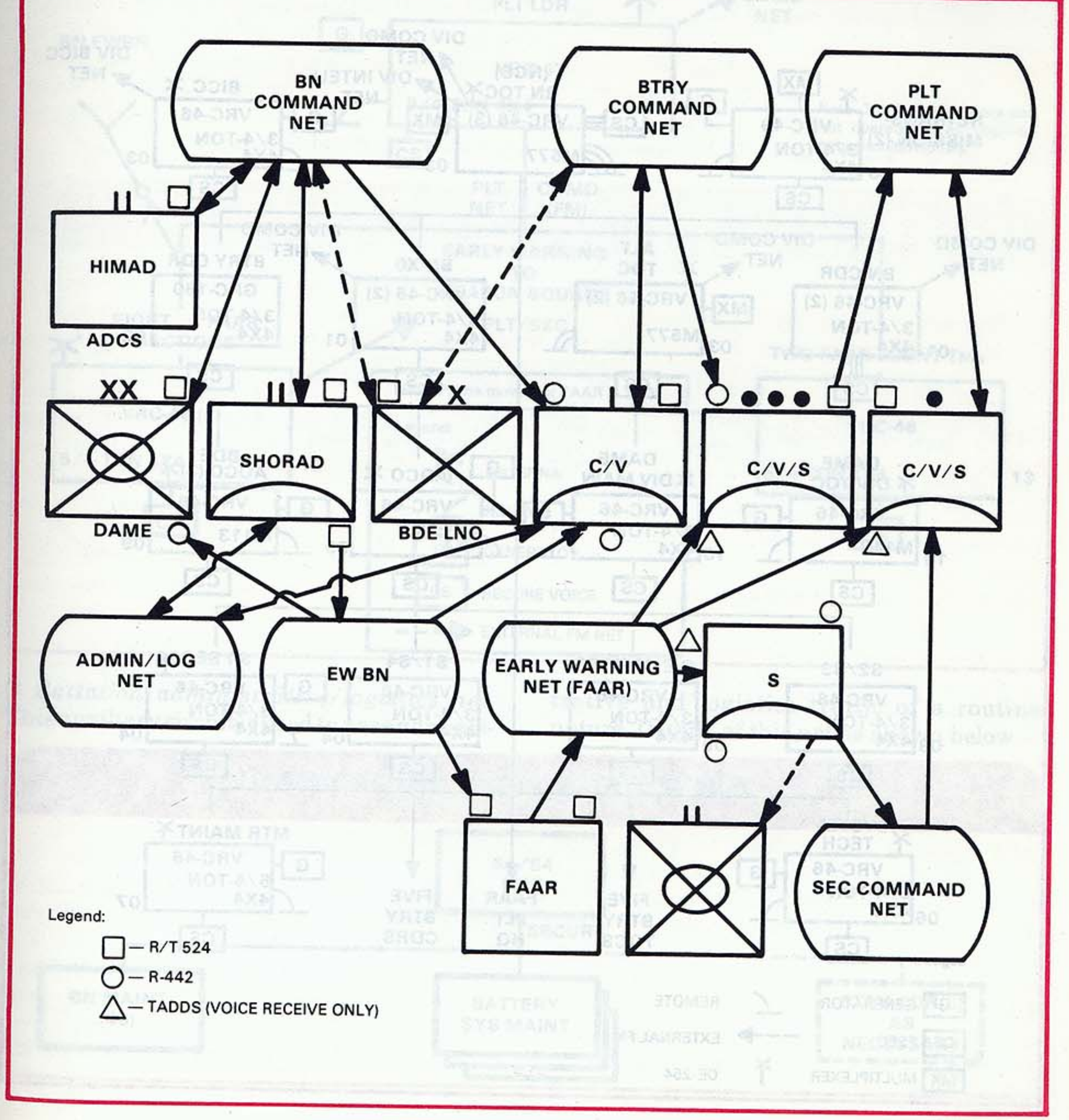
Amplitude modulated nets. An air defense coordination net (ADCW) provides communications between the battalion tactical operations center and the air defense operations center (ADCO) at a source of long-range early warning, such as a HIMAD fire direction center. C/V batteries can monitor this net with an AM receiver. The air defense communications net (ADCW) carries early warning information, air defense command and control information that is, AD warnings, weapons control status, and other emergency warning information.

AIR DEFENSE COORDINATION NET

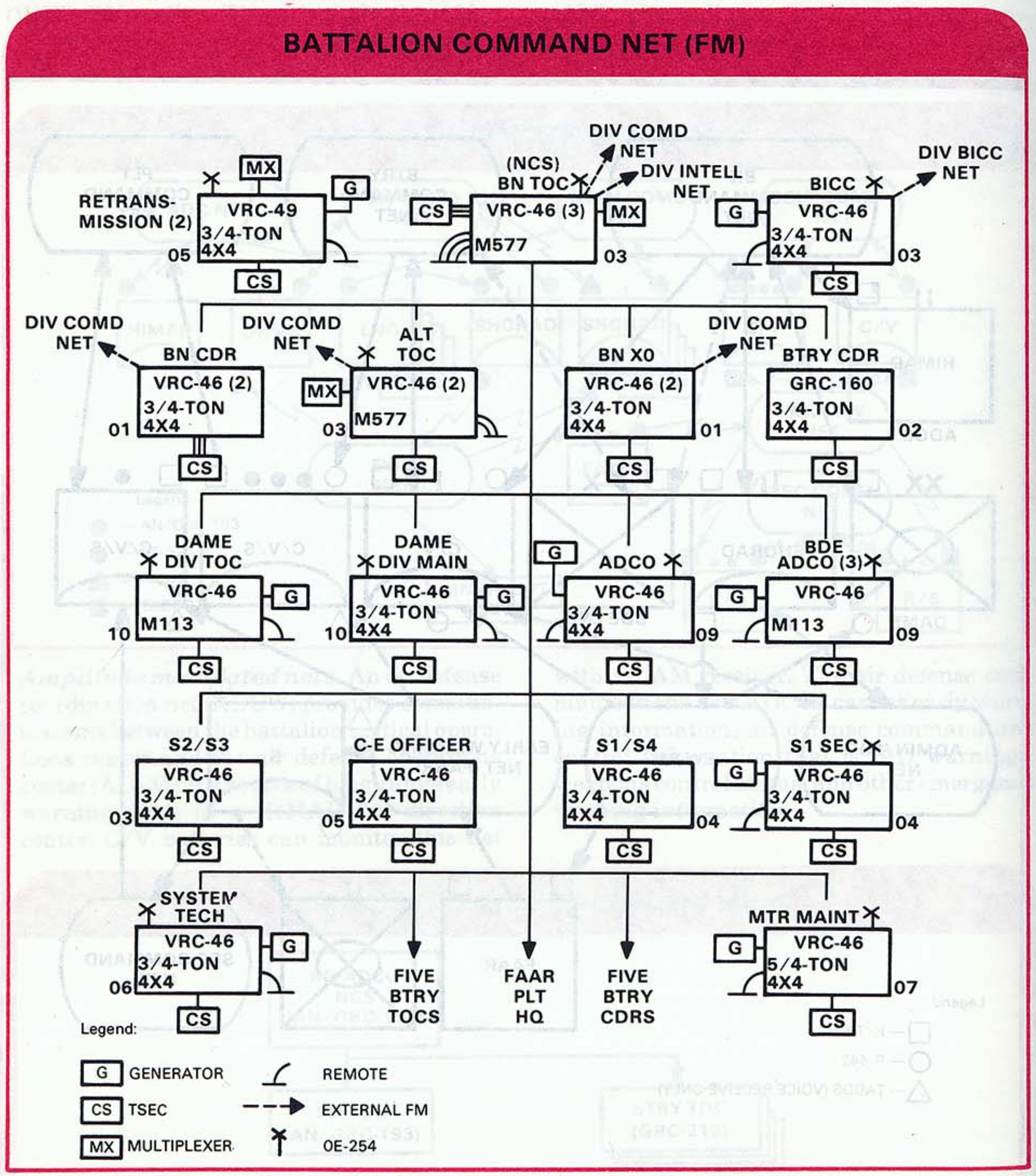


- *FM Nets.* The battalion FM (VHF) nets are shown in the following illustrations:

BATTALION FM (VHF) NETS

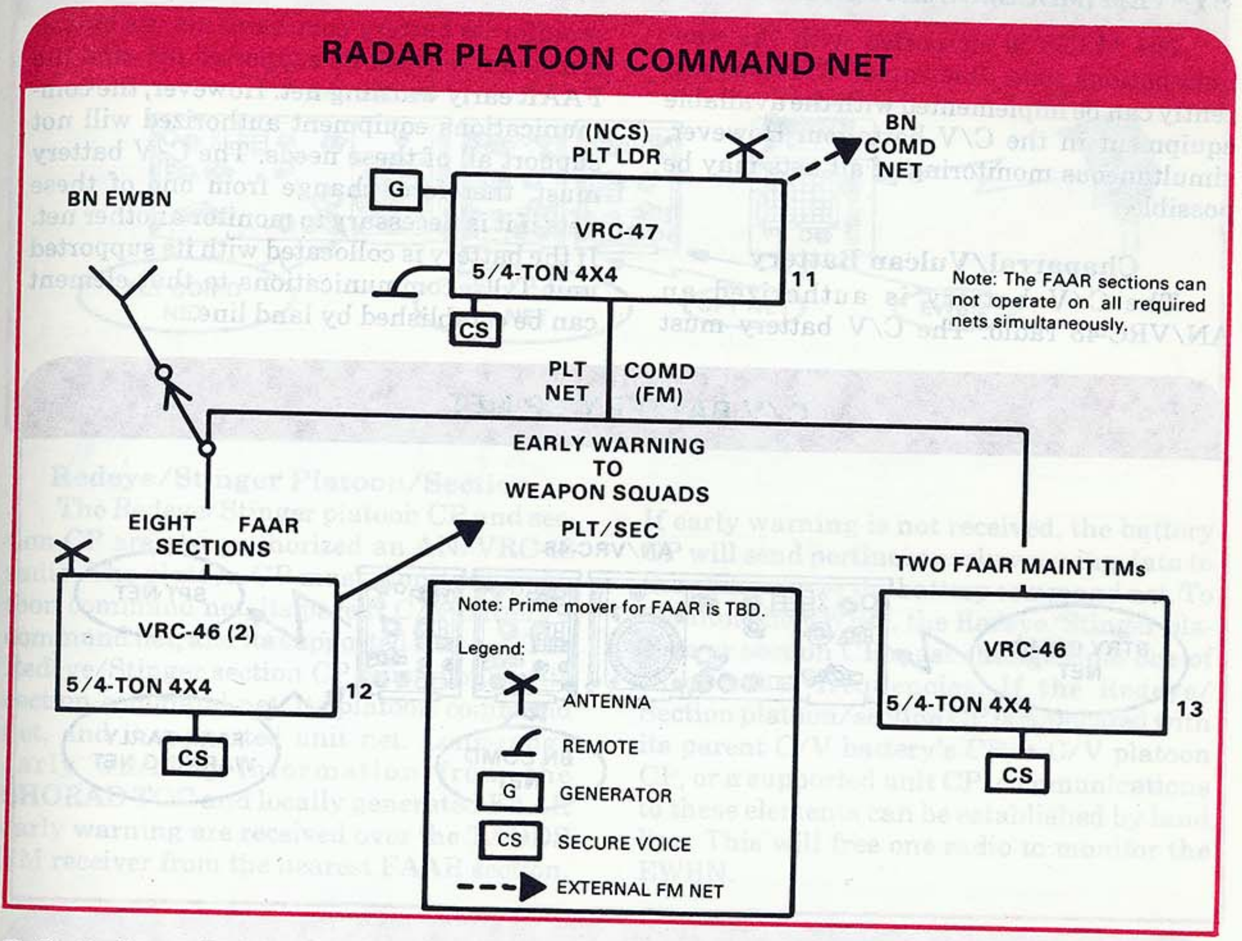


■ *Battalion command net.* The battalion command net provides key personnel in the battalion TOC and in battery CPs with a FM secure net. The S3 operations officer normally establishes the battalion TOC as the net control station. Detailed information on stations operating on this net is shown below.



BATTALION COMMAND NET (FM)

■ *Radar platoon command net.* This net is used by the FAAR platoon leader to communicate with the FAAR sections and the two FAAR maintenance teams. Details of this special platoon net are shown below.

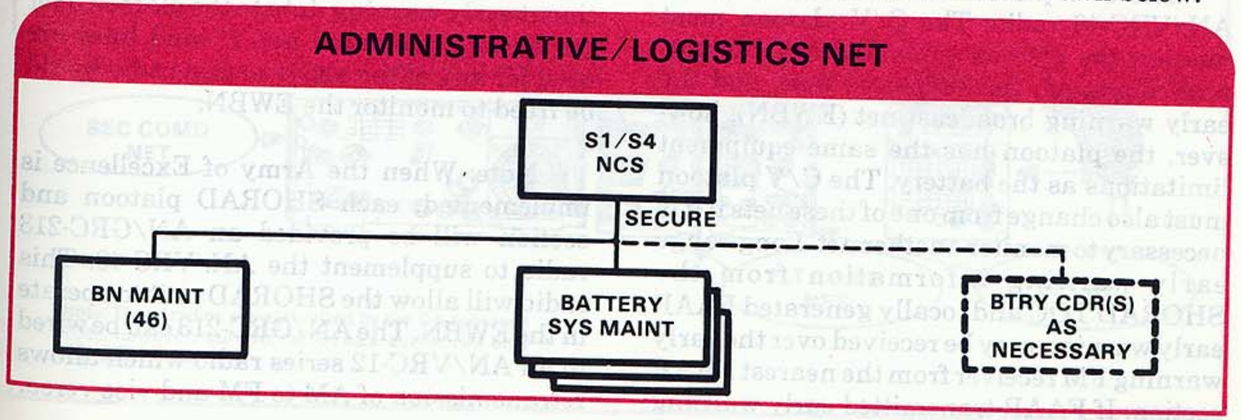


RADAR PLATOON COMMAND NET

Note: The FAAR sections can not operate on all required nets simultaneously.

Note: Prime mover for FAAR is TBD.

■ *Battalion administrative/logistics net.* This auxiliary circuit is used to pass administrative and logistics traffic of a routine nature. Details of this net as shown below.



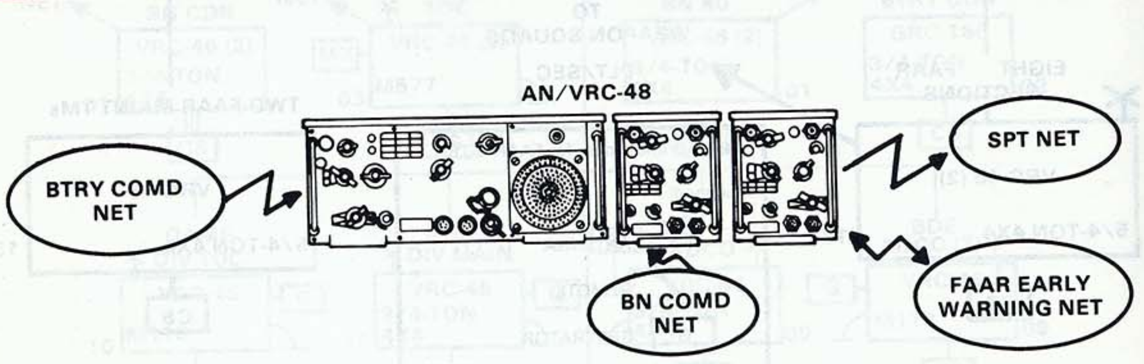
ADMINISTRATIVE/LOGISTICS NET

BASIC MANUAL SHORAD CONTROL SYSTEM (MSCS) COMMUNICATIONS

The MSCS is supported with the communications nets illustrated. The nets currently can be implemented with the available equipment in the C/V battalion. However, simultaneous monitoring of all nets may be possible.

Chaparral/Vulcan Battery

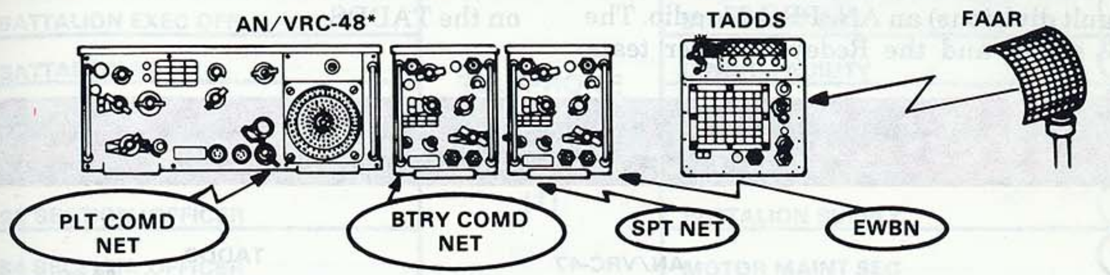
The C/V battery is authorized an AN/VRC-48 radio. The C/V battery must monitor its battery command net, its battalion command net, its supported net, and the FAAR early warning net. However, the communications equipment authorized will not support all of these needs. The C/V battery must, therefore, change from one of these nets if it is necessary to monitor another net. If the battery is collocated with its supported unit TOC, communications to that element can be established by land line.


C/V BATTERY CP NET

Chaparral/Vulcan Platoon

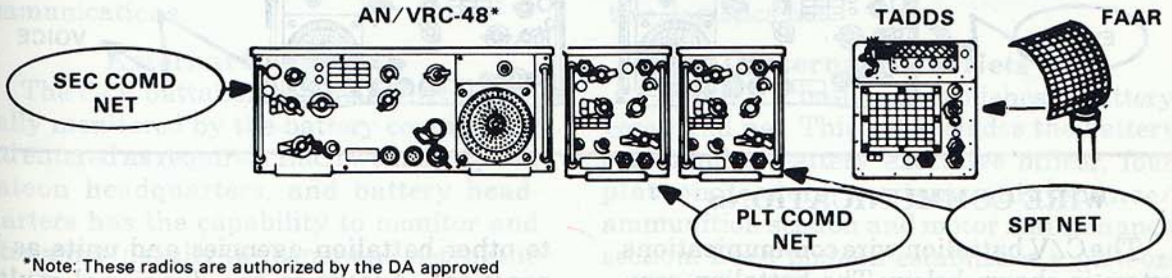
The C/V platoon is also authorized an AN/VRC-48 radio. The C/V platoon must monitor the platoon command net, the battery command, the supported unit, and the early warning broadcast net (EWBN); however, the platoon has the same equipment limitations as the battery. The C/V platoon must also change from one of these nets if it is necessary to monitor another net. Long-range early warning information from the SHORAD TOC and locally generated FAAR early warning may be received over the early warning FM receiver from the nearest FAAR section. If FAAR-transmitted early warning is not received, the battery CP will send pertinent early warning data to the platoon over the battery command net. If land lines are used for any of the above nets, a radio would be freed to monitor the EWBN.

Note: When the Army of Excellence is implemented, each SHORAD platoon and section will be provided an AN/GRC-213 radio to supplement the AN/VRC-48. This radio will allow the SHORAD unit to operate in the EWBN. The AN/GRC-213 can be wired to an AN/VRC-12 series radio which allows retransmission of AM to FM and vice versa.


CHAPARRAL/VULCAN/STINGER PLATOON COMMAND NET

Redeye/Stinger Platoon/Section

The Redeye/Stinger platoon CP and section CP are also authorized an AN/VRC-48 radio. The platoon CP must monitor its platoon command net, its parent C/V battery's command net, and its supported unit net. The Redeye/Stinger section CP must monitor its section command net, its platoon command net, and it supported unit net. Long-range early warning information from the SHORAD TOC and locally generated FAAR early warning are received over the TADDS FM receiver from the nearest FAAR section. If early warning is not received, the battery CP will send pertinent early warning data to the platoon over the battery command net. To monitor the EWBN, the Redeye/Stinger platoon or section CP must change from one of these other frequencies. If the Redeye/Section platoon/section CP is collocated with its parent C/V battery's CP, a C/V platoon CP, or a supported unit CP, communications to these elements can be established by land line. This will free one radio to monitor the EWBN.

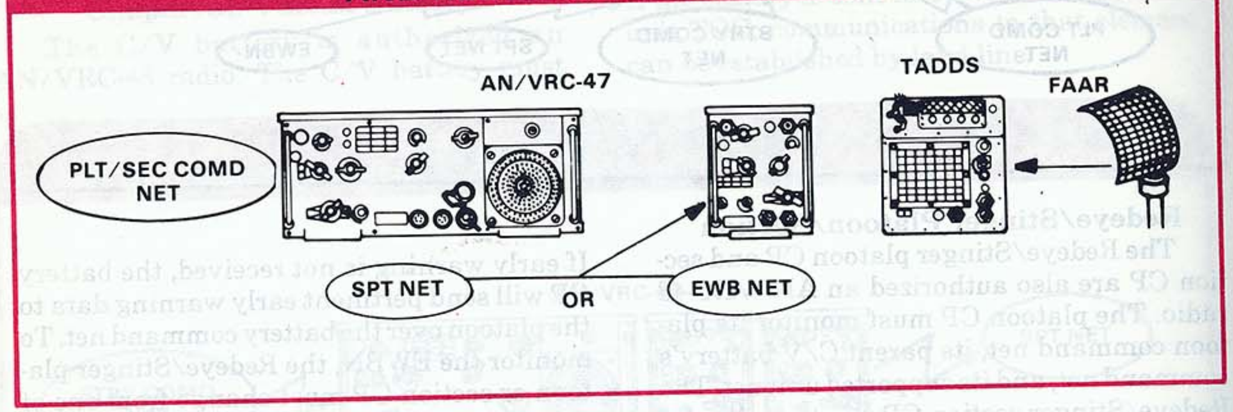

REDEYE/STINGER SECTION COMMAND NET

*Note: These radios are authorized by the DA approved TOE; however, current, MTOE&Es authorized only AN/VRC-47 radios.

Chaparral/Vulcan Squad

The C/V squad is authorized an AN/VRC-47 radio. The Redeye/Stinger team is authorized either an AN/VRC-47 radio, AN/GRC-160 radio, or (in the case of air assault divisions) an AN/PRC-77 radio. The C/V squad and the Redeye/Stinger team must monitor the squad's or team's respective platoon or section command net, and either the supported unit command net or the EWBN. The squads/teams monitor the FAAR on the TADDS.

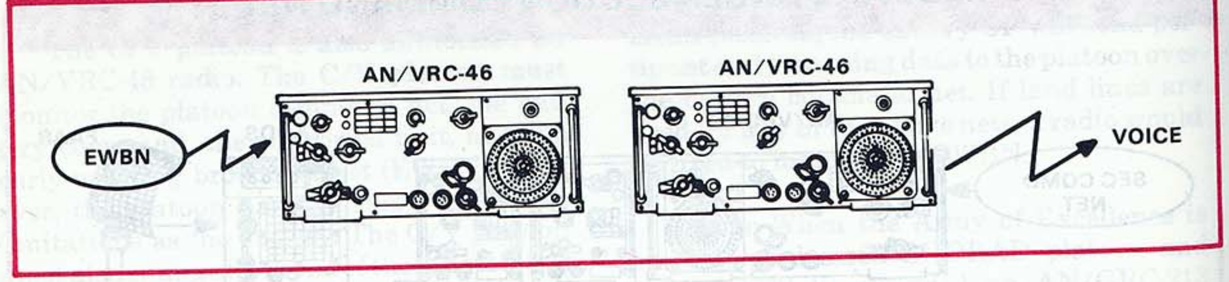
CHAPARRAL/VULCAN SQUADS AND REDEYE/STINGER TEAMS



FORWARD AREA ALERTING RADAR (FAAR)

One of the FAAR's AN/VRC-46 receiver-transmitters is used to transmit early warning and command and control information. The FAAR's other radio, also an AN/VRC-46, is used to monitor the EWBN rather than the FAAR platoon command net.

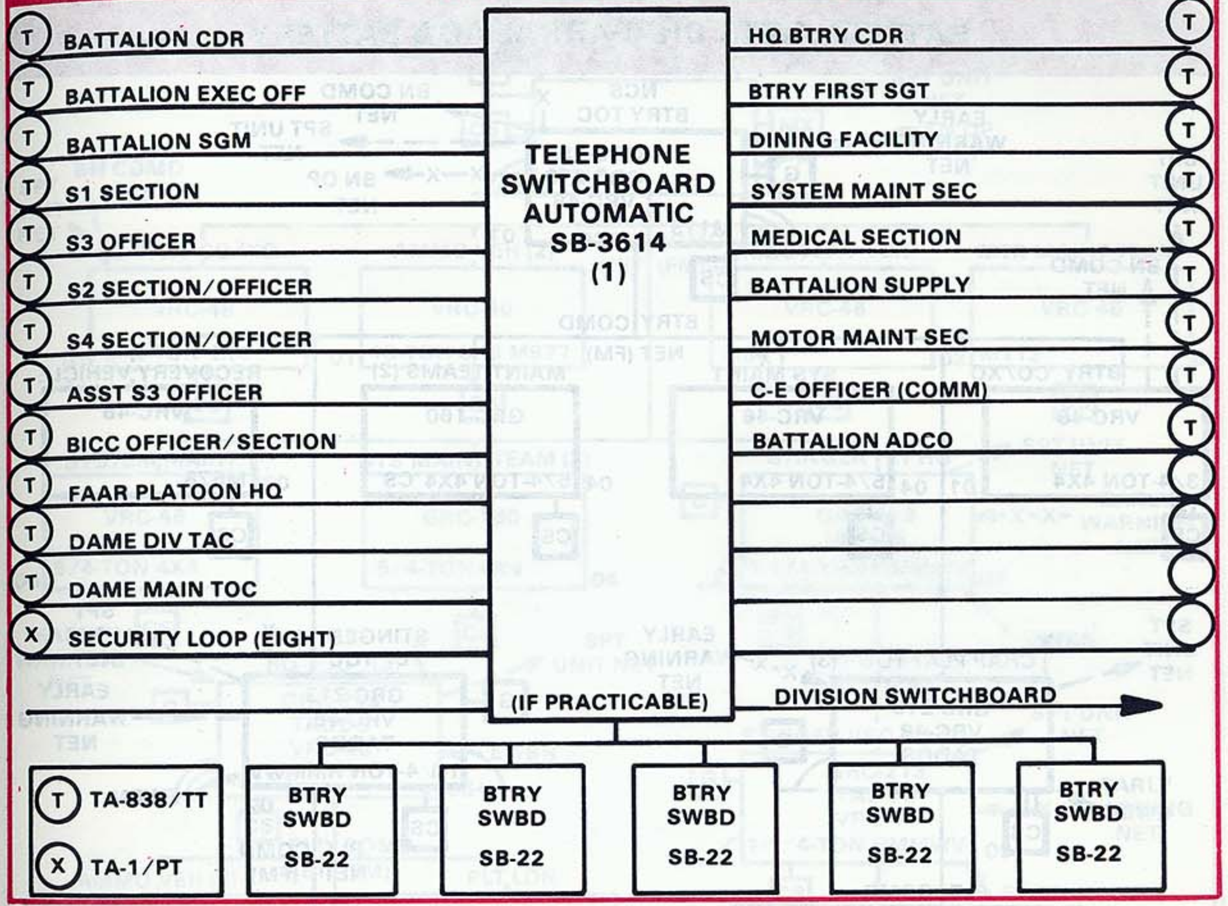
FORWARD AREA ALERTING RADAR



WIRE COMMUNICATIONS

The C/V battalion wire communications system is shown below. The battalion communications section normally installs wire throughout the battalion headquarters and to other battalion agencies and units as is practical. Access to the divisional multichannel communications system is provided by the division signal battalion.

TYPE WIRE COMMUNICATIONS SYSTEM, DIVISIONAL C/V BATTALION



FIRING BATTERY COMMUNICATIONS

Firing battery communications consists of external and internal radio nets and wire communications.

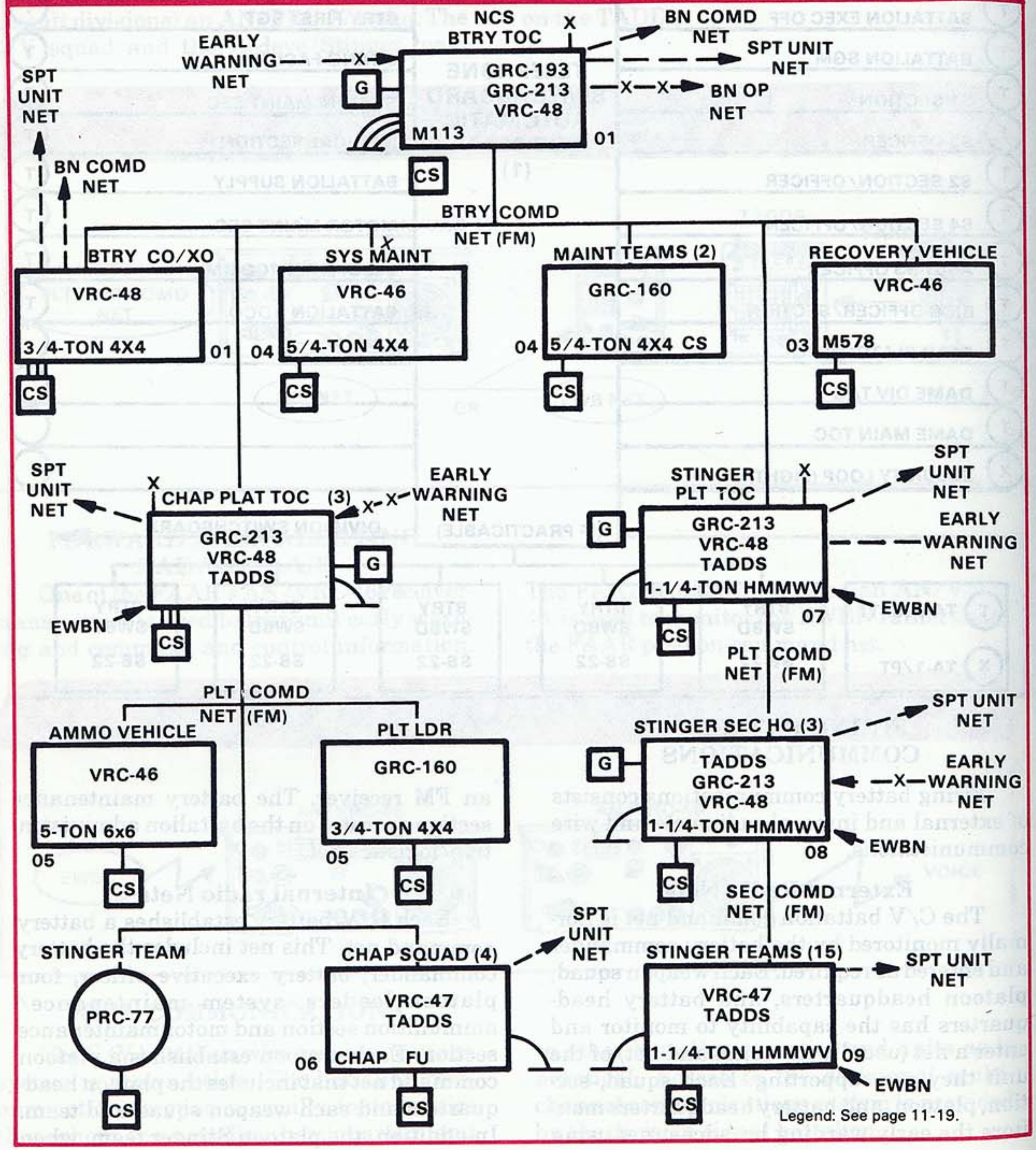
External Radio Nets

The C/V battalion command net is normally monitored by the battery commander and entered as required. Each weapon squad, platoon headquarters, and battery headquarters has the capability to monitor and enter a net (usually the command net) of the unit they are supporting. Each squad, section, platoon, and battery headquarters monitors the early warning broadcast net using an FM receiver. The battery maintenance section operates on the battalion administrative/logistics net.

Internal radio Nets

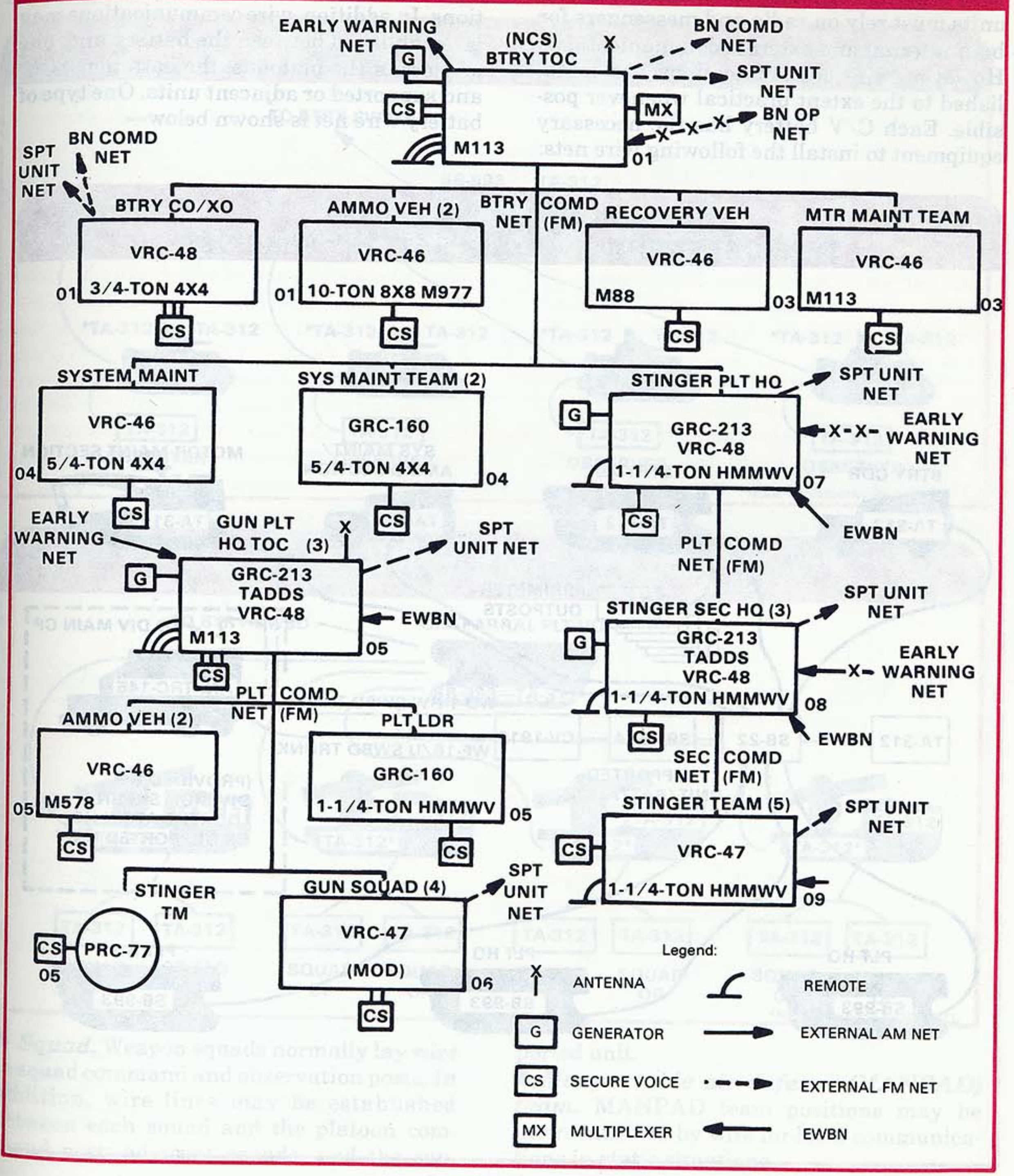
Each C/V battery establishes a battery command net. This net includes the battery commander, battery executive officer, four platoon leaders, system maintenance/ammunition section and motor maintenance section. Each platoon establishes a platoon command net that includes the platoon headquarters and each weapon squad and team. In addition, the platoon Stinger team, when deployed, enters the Chaparral platoon command nets. Chaparral/Vulcan AIM divisional firing battery nets are shown in illustrations in the following pages.

BATTERY NETS CHAPARRAL ADA BATTERY



Legend: See page 11-19.

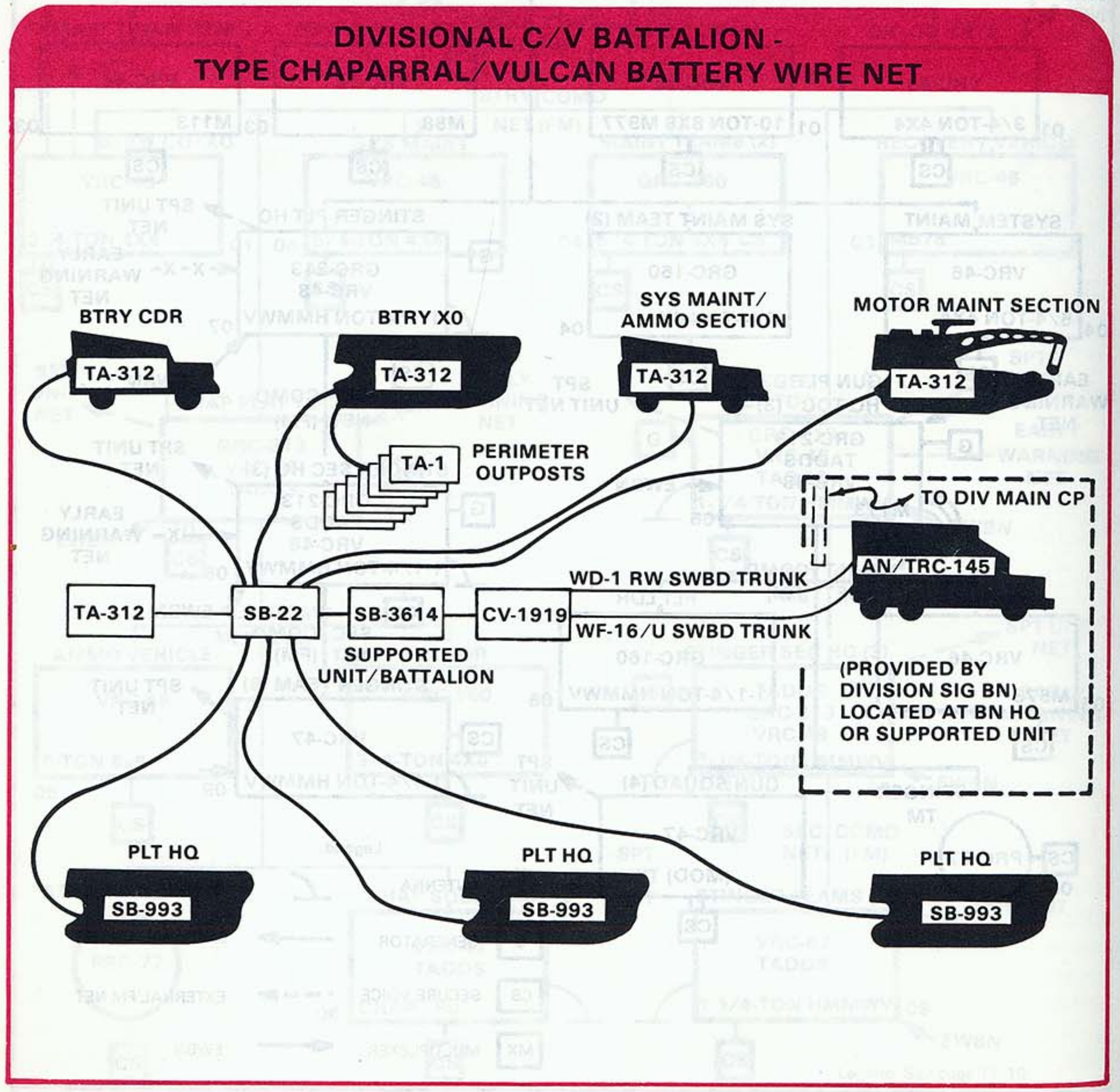
BATTERY NETS, VULCAN ADA BATTERY



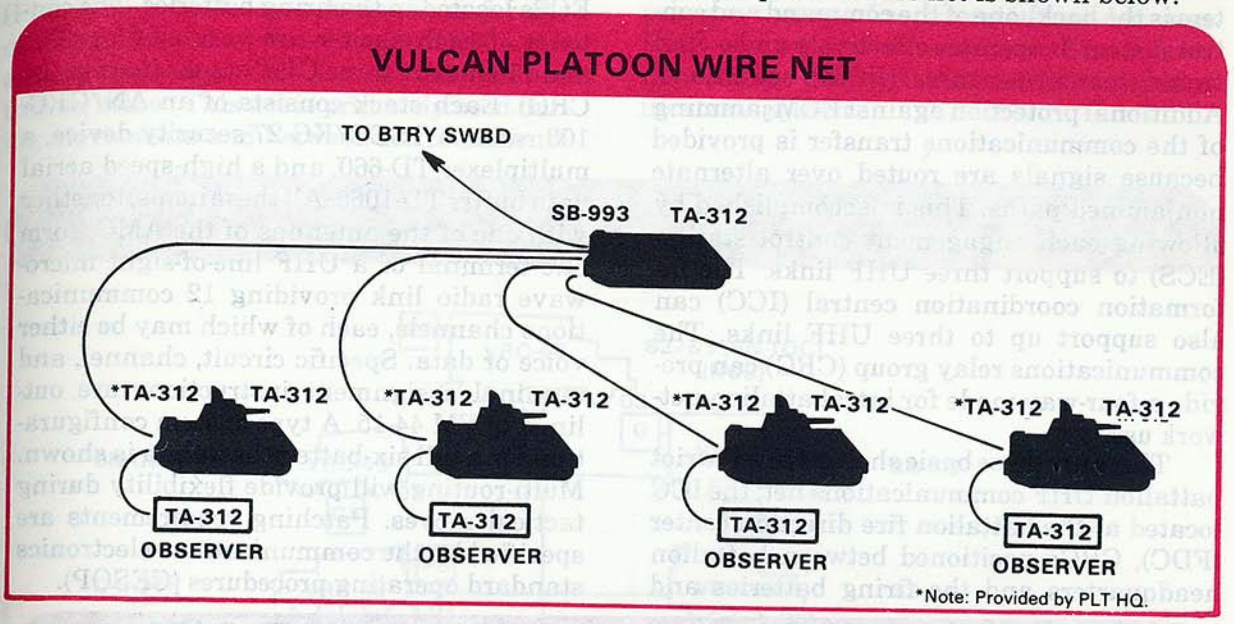
Wire Communications

Often the tactical situation makes use of wire communications impractical, and C/V units must rely on radio and messengers for both internal and external communications. However, wire communications are established to the extent practical whenever possible. Each C/V battery has the necessary equipment to install the following wire nets:

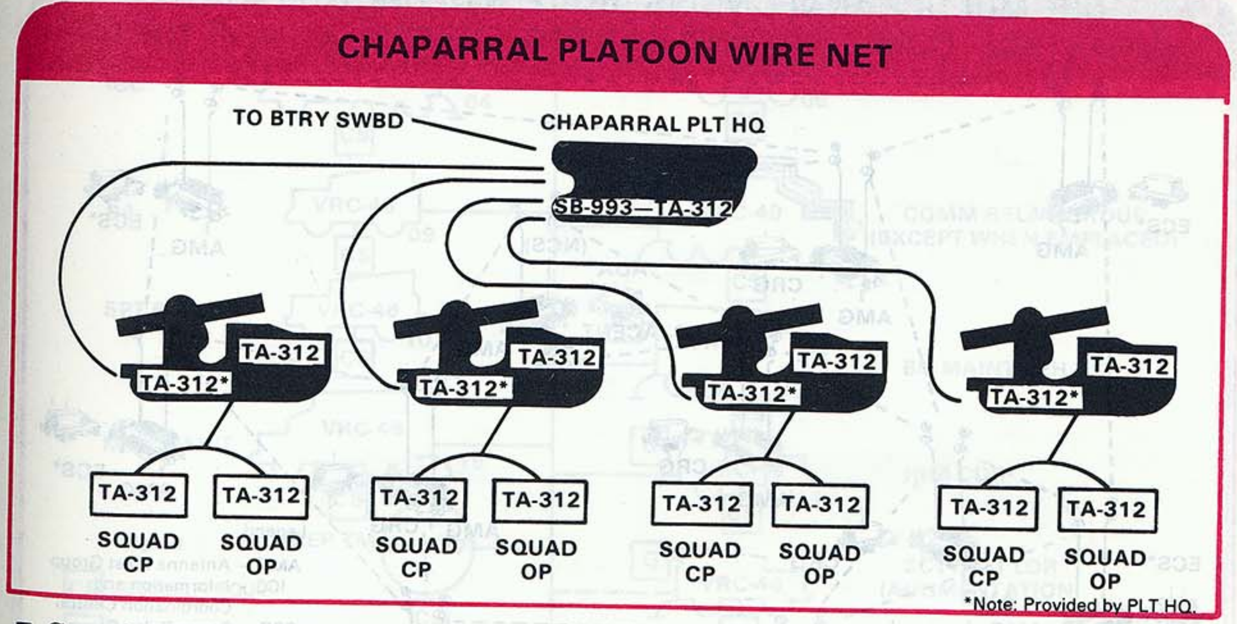
- **_Battery._** Each C/V battery will normally establish intrabattery CP wire communications. In addition, wire communications may be established between the battery and, one or more of the platoons, the battalion TOC, and supported or adjacent units. One type of battery wire net is shown below—


DIVISIONAL C/V BATTALION - TYPE CHAPARRAL/VULCAN BATTERY WIRE NET

- **_Platoon._** Wire nets may be established between each platoon and the battery command post, and supported unit. A typical Vulcan platoon wire net is shown below.


VULCAN PLATOON WIRE NET

*Note: Provided by PLT HQ.


CHAPARRAL PLATOON WIRE NET

*Note: Provided by PLT HQ.

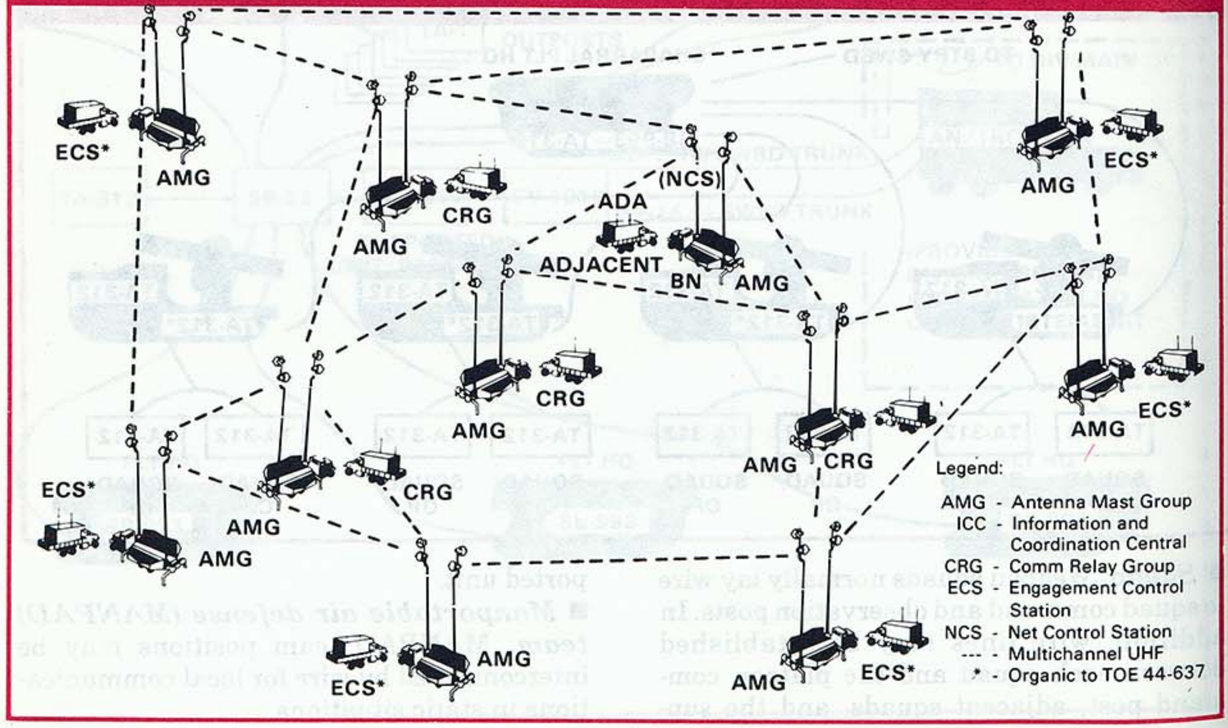
- **_Squad._** Weapon squads normally lay wire to squad command and observation posts. In addition, wire lines may be established between each squad and the platoon command post, adjacent squads, and the supported unit.
- **_Manportable air defense (MANPAD) team._** MANPAD team positions may be interconnected by wire for local communications in static situations.

PATRIOT COMMUNICATIONS

The Patriot UHF communications system is the backbone of the command and control system. It operates effectively under electronic countermeasures (ECM) conditions. Additional protection against ECM jamming of the communications transfer is provided because signals are routed over alternate nonjammed paths. This is accomplished by allowing each engagement control station (ECS) to support three UHF links. The information coordination central (ICC) can also support up to three UHF links. The communications relay group (CRG) can provide a four-way mode for intrabattalion network use.

There are three basic shelters in a Patriot battalion UHF communications net: the ICC located at the battalion fire direction center (FDC), CRGs positioned between battalion headquarters and the firing batteries and between adjacent firing batteries, and the ECSs located in the firing batteries. The contents of each shelter are very similar. The main items are three UHF stacks (four in the CRG). Each stack consists of an AN/GRC-103 radio, a TSEC/KG-27 security device, a multiplexer TD-660, and a high-speed aerial data buffer TD-1065. All these items, together with one of the antennas of the AMG, form one terminal of a UHF line-of-sight microwave radio link providing 12 communications channels, each of which may be either voice or data. Specific circuit, channel, and terminal assignment instructions are outlined in FM 44-15. A type system configuration for a full six-battery battalion is shown. Multi-routing will provide flexibility during tactical moves. Patching requirements are specified by the communications electronics standard operating procedures (CESOP).

UHF MULTICHANNEL NET (SECURE) MULTIROUTED DATA AND VOICE, COMMAND AND CONTROL, HHB, ADA BN, PATRIOT

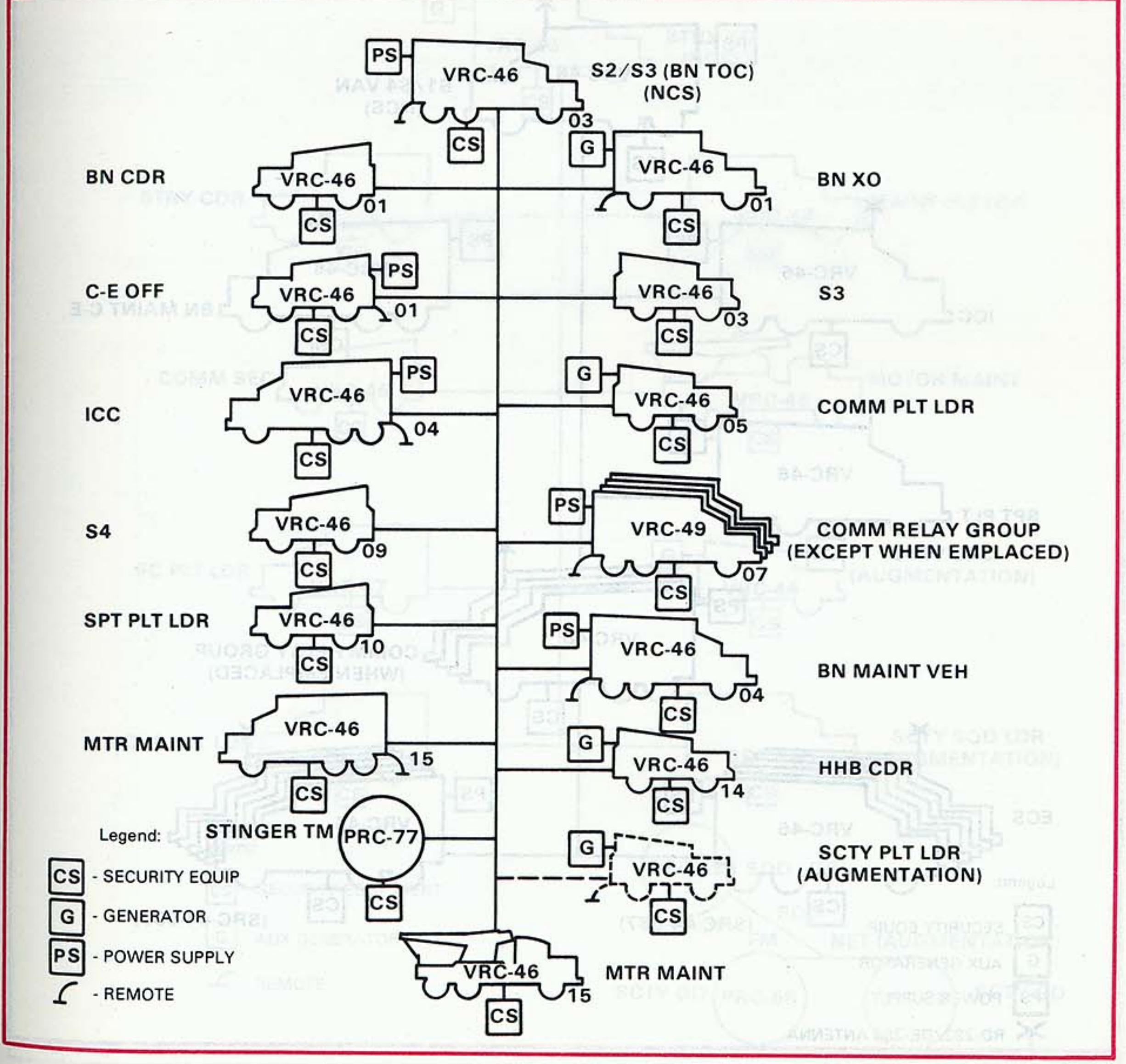


Legend:
AMG - Antenna Mast Group
ICC - Information and Coordination Central
CRG - Comm Relay Group
ECS - Engagement Control Station
NCS - Net Control Station
---- Multichannel UHF
* - Organic to TOE 44-637

HHB COMMAND NET

The purpose of the HHB command net (FM) is to provide communications for the command function of the Patriot HHB. Each station operating in the net is shown in illustration below. This net is primarily used during movements and between HHB elements at separate positions. Wire is normally the primary means of communications between HHB elements when emplaced. The following nets are used within the Patriot communications system.

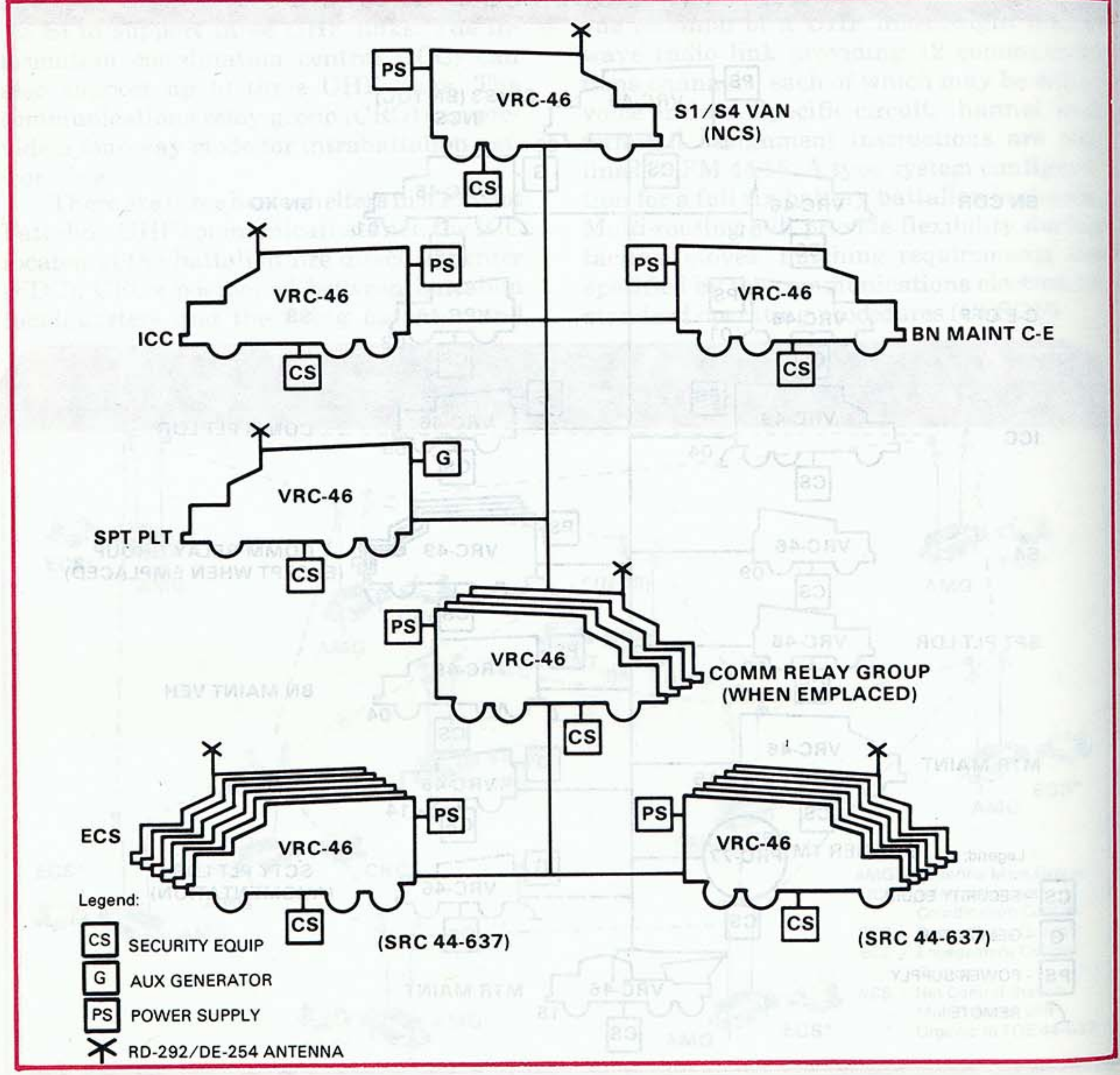
PATRIOT HHB COMMAND NET (FM)



Battalion Administrative/Logistics Net

The purpose of this FM net is to provide communications for the administrative and logistics functions of the battalion. (See the battalion administrative/logistics net (FM) illustration.) Stations include the ICC, CRGs, battalion and battery maintenance centers, ECSs, and the support platoon. The net control station (NCS) is located at the S1/S4 van. Every station in the net is cryptographically secure. CRGs may operate as radio relays when required.

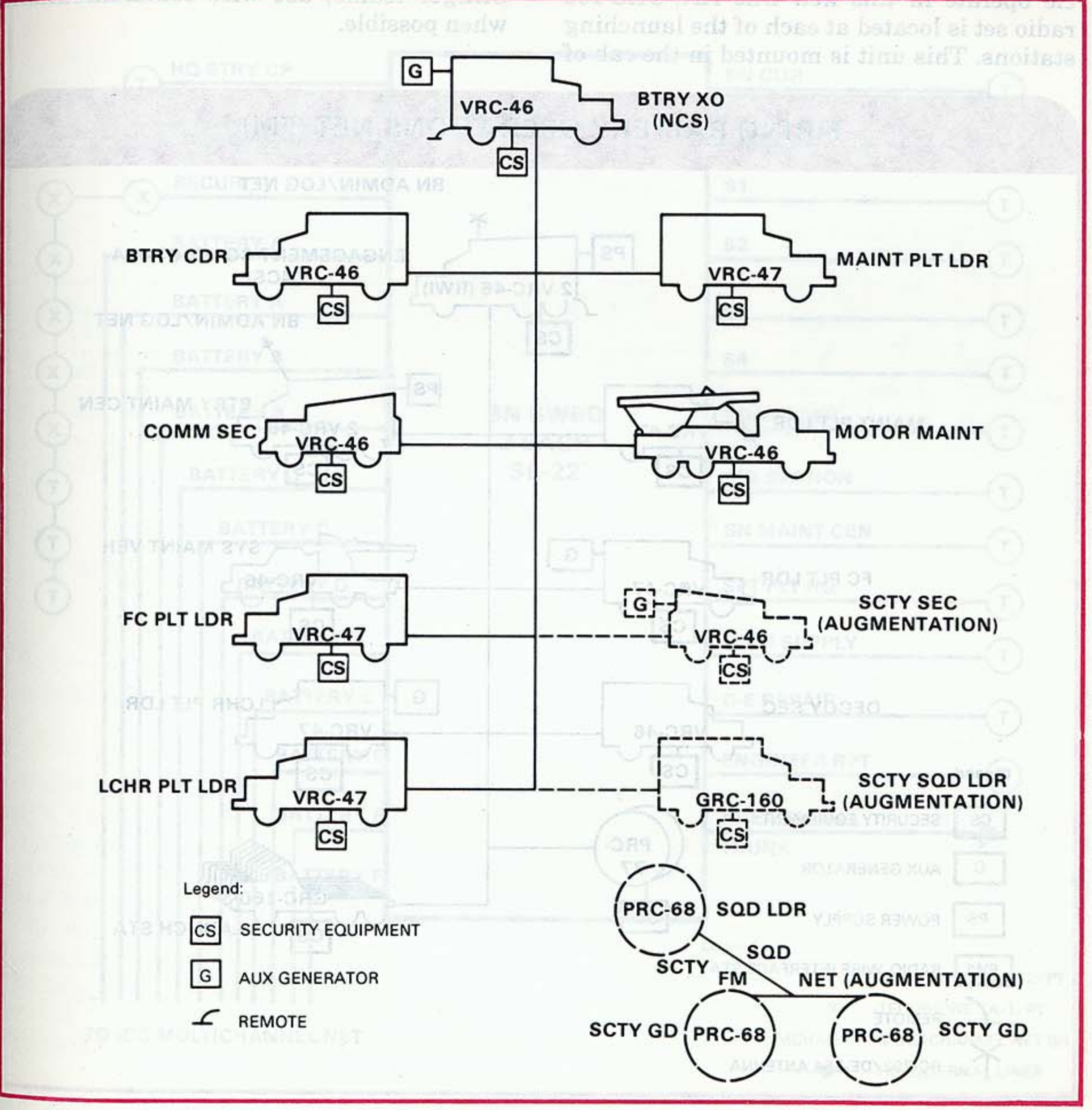
BATTALION ADMINISTRATIVE/LOGISTICS NET (FM)



Firing Battery Command Net

The purpose of this FM net (see the firing battery command net (FM) illustration) is to provide communications for the battery command function. The NCS is in the battery executive officer's vehicle. This net is primarily used during unit moves. Wire is used when the battery is emplaced.

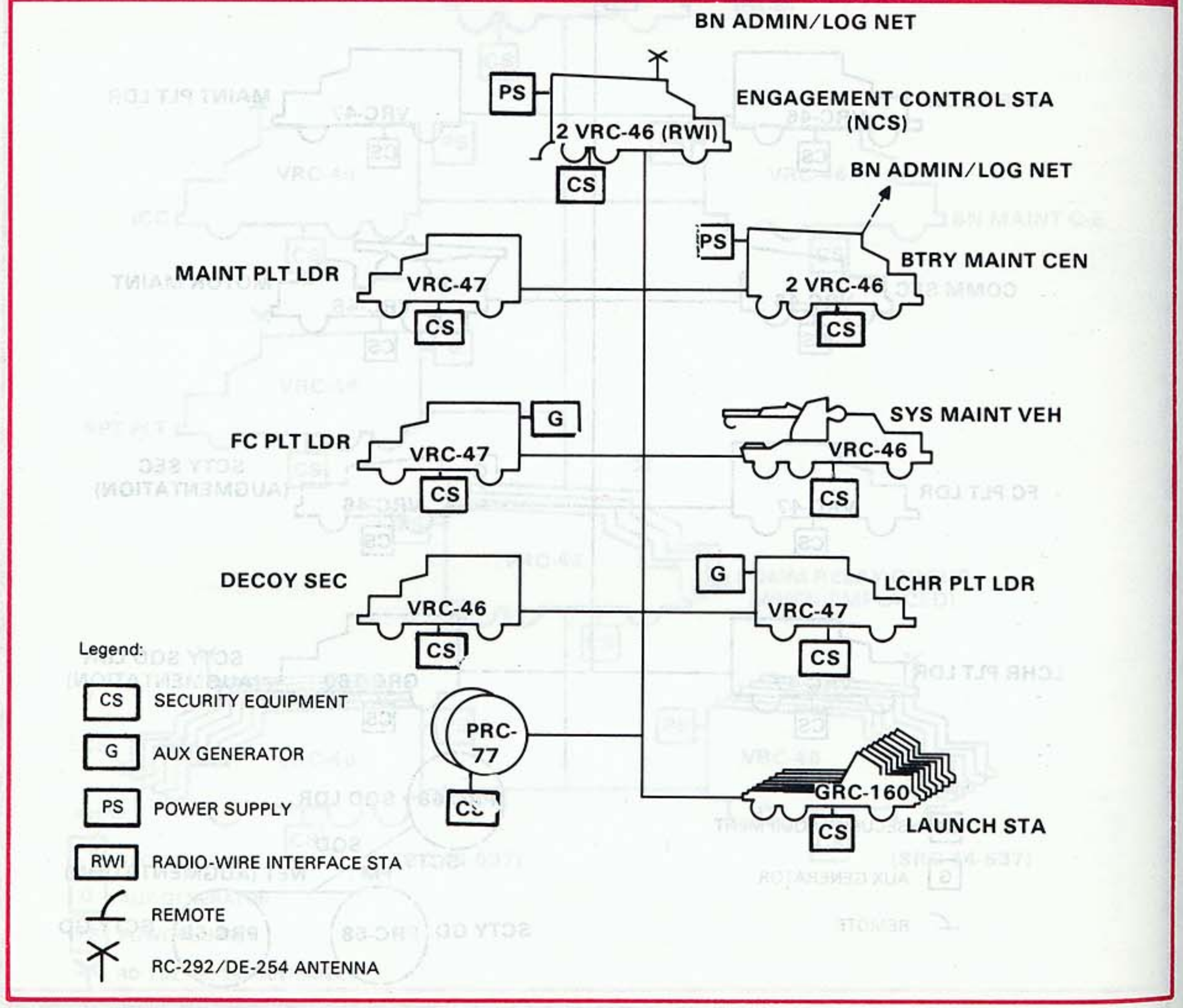
FIRING BATTERY COMMAND NET (FM)



Firing Battery Operations Net

The net control station for the firing battery operations command net (see illustration) is the ECS, equipped with a VRC-46. The fire control platoon leader operates in this net with a VRC-47. He also monitors the firing battery command net. The maintenance center (MC) and the maintenance vehicle operate in this net. One AN/GRC-160 radio set is located at each of the launching stations. This unit is mounted in the cab of the tractor, but is removed and used in a manpack configuration for emplacement communications as the tractor is dispersed from the LS site. In either configuration, the set operates in the firing battery operations net. Each set in this net is cryptographically secure. Normally, all elements in this net, except the Stinger teams, use wire communications when possible.

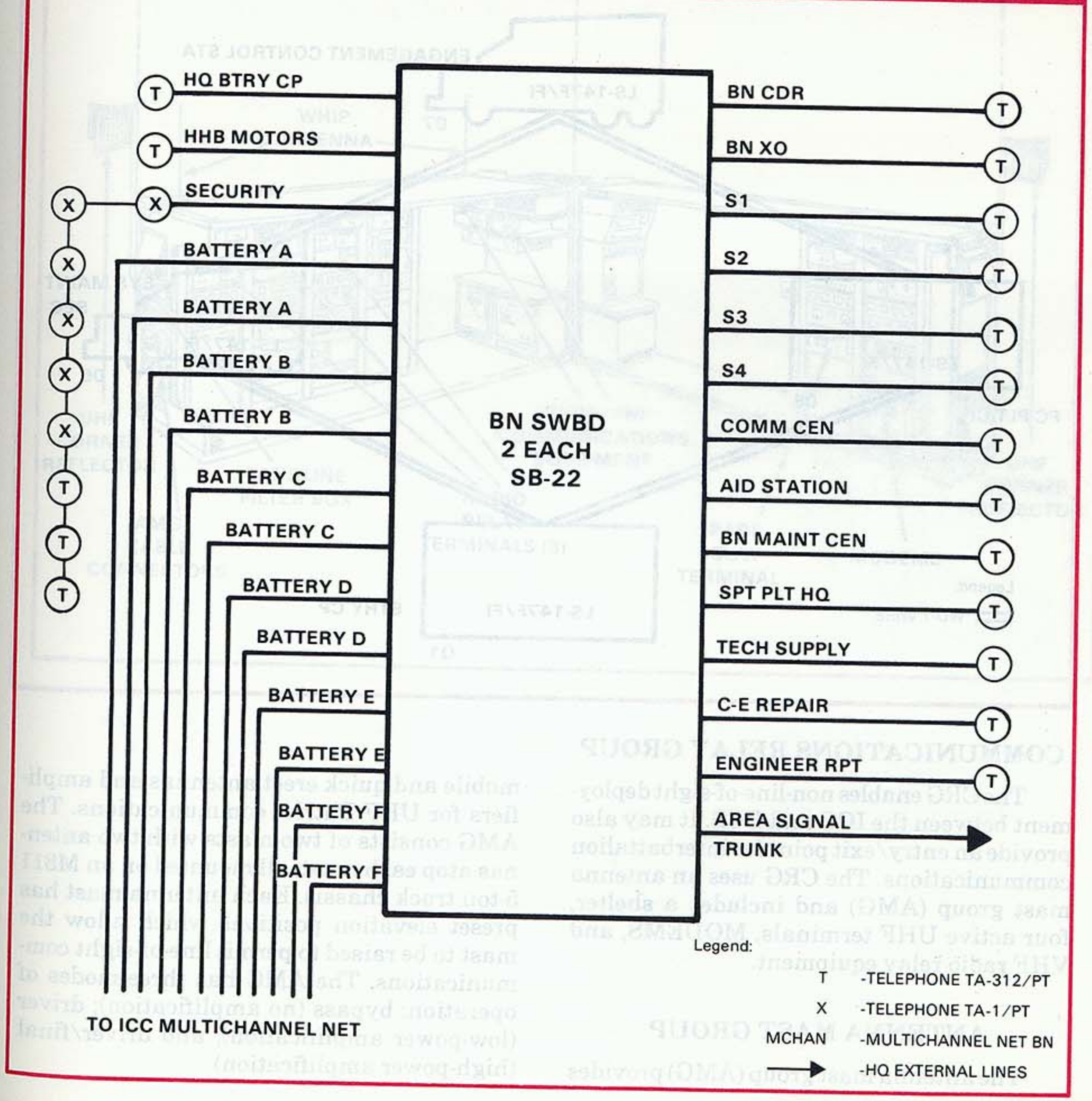
FIRING BATTERY OPERATIONS NET (FM)



BATTALION WIRE NET

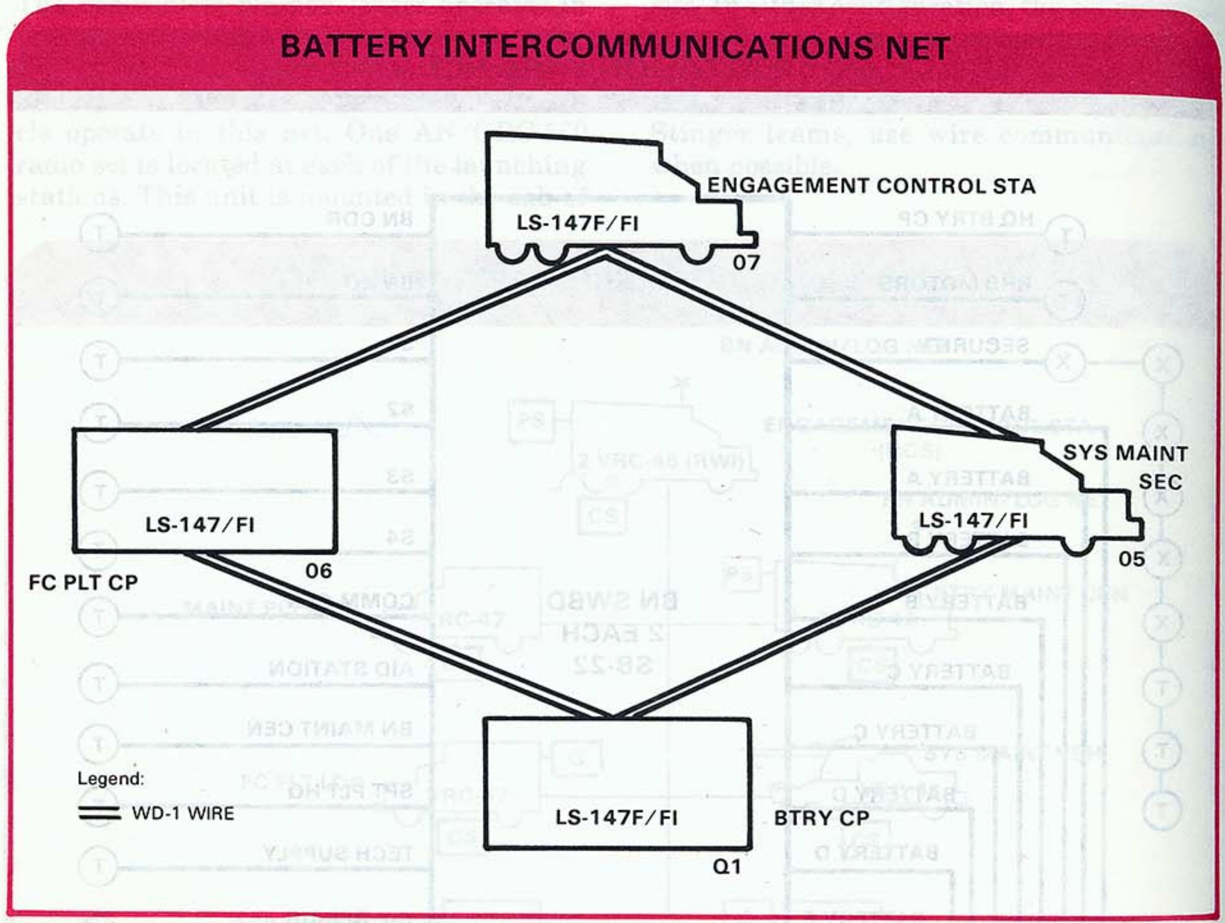
The battalion wire net is shown in the following illustration. The battalion wire net is the primary means of communications between HHB elements. The switchboard also provides access to a minimum of two circuits to each firing battery.

BATTALION WIRE NET



BATTERY WIRE NET

The ECS, maintenance center, fire control platoon CP, and battery CP are linked by wire. This net allows for rapid communications among key elements of the firing battery. Maintenance support can also be requested without leaving the ECS.

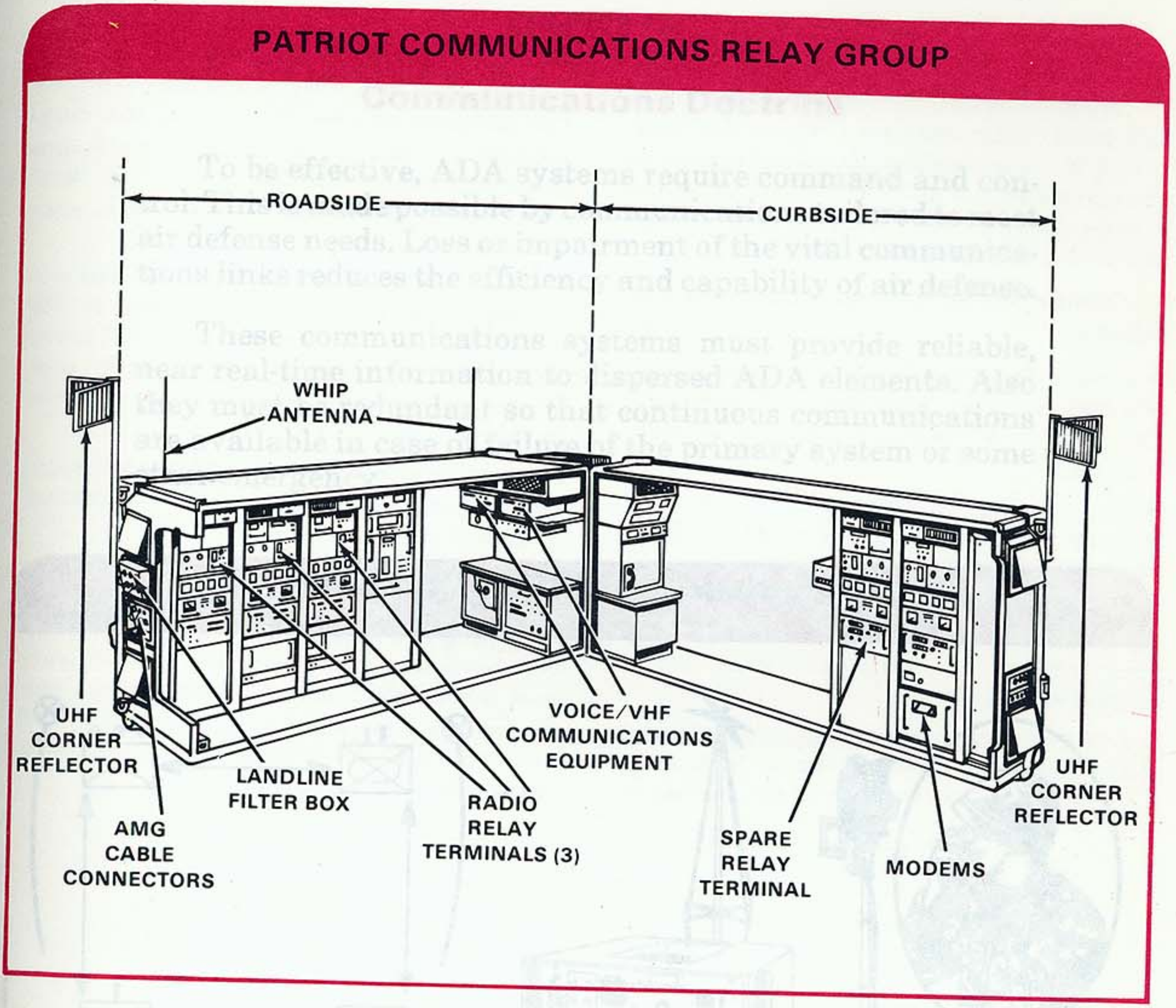

BATTERY INTERCOMMUNICATIONS NET

COMMUNICATIONS RELAY GROUP

The CRG enables non-line-of-sight deployment between the ICC and ECS. It may also provide an entry/exit point for interbattalion communications. The CRG uses an antenna mast group (AMG) and includes a shelter, four active UHF terminals, MODEMS, and VHF radio relay equipment.

ANTENNA MAST GROUP

The antenna mast group (AMG) provides mobile and quick erect antennas and amplifiers for UHF Patriot communications. The AMG consists of two masts with two antennas atop each mast, all mounted on an M811 5-ton truck chassis. Each antenna mast has preset elevation positions which allow the mast to be raised to permit line-of-sight communications. The AMG has three modes of operation: bypass (no amplification); driver (low-power amplification); and driver/final (high-power amplification).


PATRIOT COMMUNICATIONS RELAY GROUP

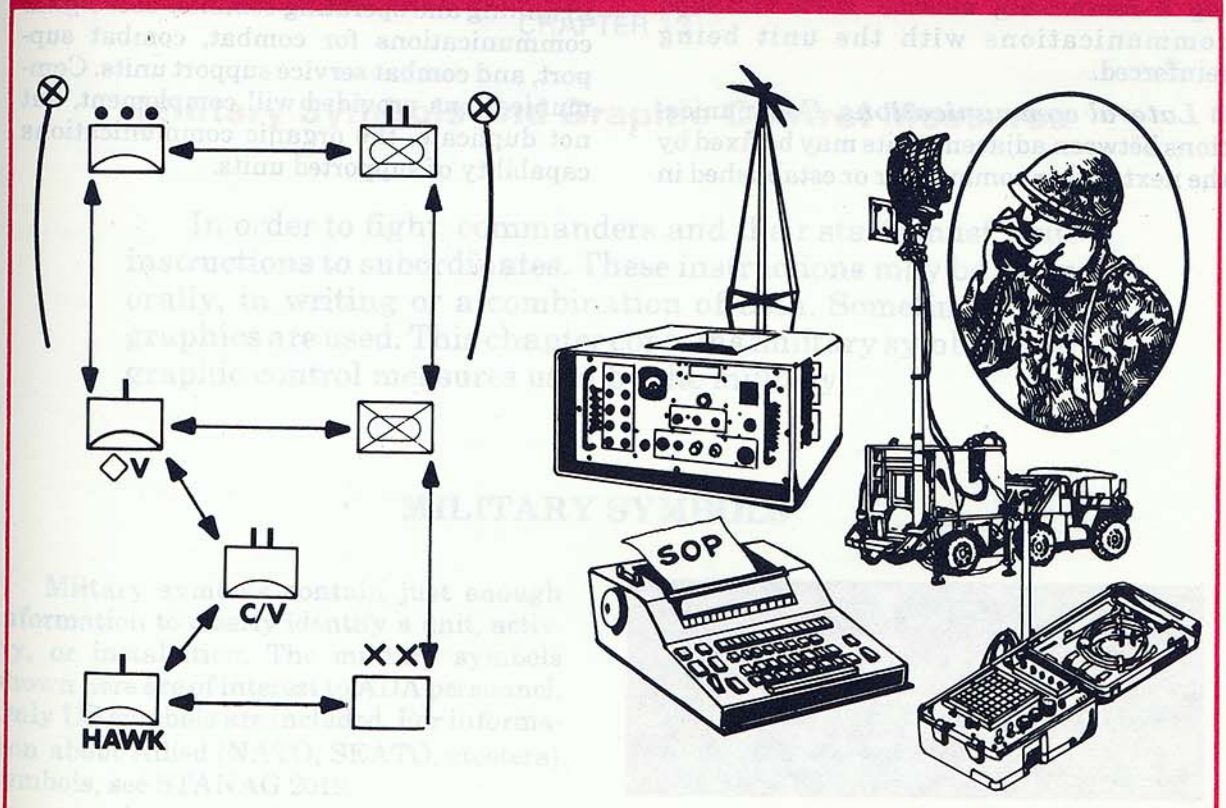
CHAPTER 12

Communications Doctrine

To be effective, ADA systems require command and control. This is made possible by communications tailored to meet air defense needs. Loss or impairment of the vital communications links reduces the efficiency and capability of air defense.

These communications systems must provide reliable, near real-time information to dispersed ADA elements. Also they must be redundant so that continuous communications are available in case of failure of the primary system or some other emergency.

COMMAND AND CONTROL COMMUNICATIONS



Each ADA unit commander must establish good communications within his command. He exercises command and control of the organic signal units. His staff C-E officer is responsible for coordinating with the signal unit, as explained in FM 24-1.

The principles of communications are as follows:

- ■ ***Senior to subordinate.*** The commander of a higher echelon must establish communications with a lower echelon, or a subordinate unit.
- ■ ***Supporting to supported.*** The commander of a supporting unit must establish communications with the supported unit.
- ■ ***Reinforcing to reinforced.*** A unit having a reinforcing mission must establish communications with the unit being reinforced.
- ■ ***Lateral communications.*** Communications between adjacent units may be fixed by the next higher commander or established in the standing operating procedure (SOP). In the absence of specific orders, the commander of the unit on the left establishes communications with the unit on the right facing the forward edge of the battle area (FEBA).
- ■ ***Communications security.*** A communications security training program is the responsibility of the commander. All members of the command must be security conscious and be aware of their responsibilities in this regard.
- ■ ***Maintenance.*** All commanders are responsible for taking immediate action to restore disrupted communications.
- ■ ***Common signal communications support.*** The Signal Corps is responsible for installing and operating common-user signal communications for combat, combat support, and combat service support units. Communications provided will complement, but not duplicate, the organic communications capability of supported units.

CHAPTER 13

Military Symbols and Graphic Control Measures

In order to fight, commanders and their staffs must issue instructions to subordinates. These instructions may be given orally, in writing or a combination of both. Sometimes only graphics are used. This chapter contains military symbols and graphic control measures used by the military.

MILITARY SYMBOLS

Military symbols contain just enough information to clearly identify a unit, activity, or installation. The military symbols shown here are of interest to ADA personnel. Only US symbols are included. For information about Allied (NATO, SEATO, etcetera) symbols, see STANAG 2019.

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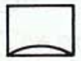
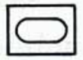
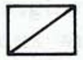
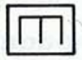
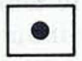
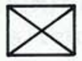
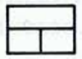
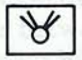
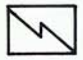
MILITARY SYMBOLS 13-1

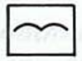
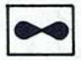
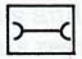
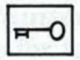
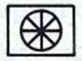
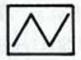
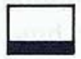
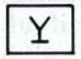
MAPS AND OVERLAYS 13-6

WORLD GEOGRAPHIC REFERENCE SYSTEM 13-10

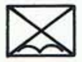
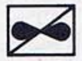
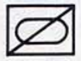
MILITARY SYMBOLS

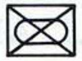
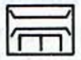
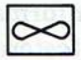
Branch and Duty Symbols

Symbol	Description
	Air Defense Artillery
	Armor
	Cavalry or Reconnaissance
	Engineer
	Field Artillery
	Infantry
	Medical
	Ordnance
	Signal

Symbol	Description
	Airborne
	Army Aviation
	Repair and Maintenance
	Quartermaster
	Transportation
	Electronic warfare
	Supply units
	Air Assault. When the V is combined with a stem, it indicates organic aircraft are available for air movement.

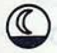
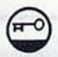
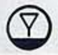
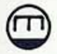
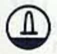
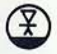
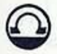
Combining Branch and Duty

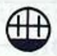
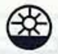
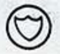
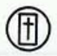
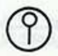
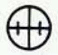
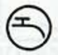
Symbol	Description
	Airborne Infantry (gulls wings and infantry symbols combined).
	Air Cavalry (Cavalry and Army Aviation symbols combined).
	Armored Cavalry (Cavalry and Armor symbols combined).

Symbol	Description
	Mechanized infantry (Armor and infantry symbols combined).
	Engineer, Bridge (Engineer symbol combined with the topographic bridge symbol).
	US Air Force unit, aircraft, facilities, etc. (unshaded propeller).

MILITARY SYMBOLS (CONTINUED)

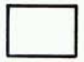
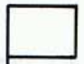
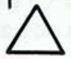
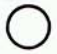
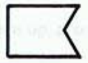
Combat Service Support Symbols

Symbol		Designation
	Class I	Subsistence
	Class II	Clothing, Equipment, Tentage, Supplies
	Class III	POL (Ground)
	Class IV	Construction
	Class V	Ammunition (all types)
	Class VI	Personal Demand Items
	Class VII	Major End Items

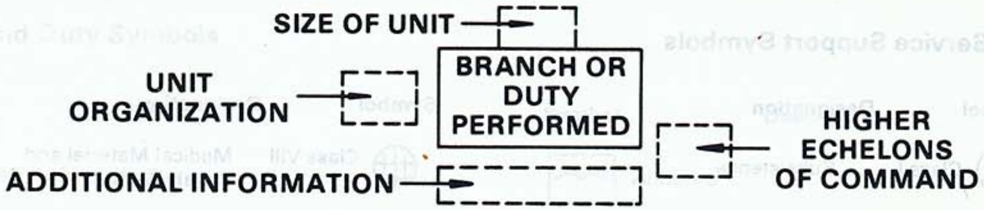
Symbol		Designation
	Class VIII	Medical Materiel and Repair Parts
	Class IX	Repair Parts
	Class X	Materiel to Support Non-Military Programs
	Graves Services	
	Traffic Control	
	Hospital or Aid Station	
	Water	

Size and Type of Activity Symbols

Symbol	Designation
●	Squad/Team
● ●	Section
● ● ●	Platoon-Detachment
I	Company-Troop-Battery
II	Battalion-Squadron
III	Regiment
X	Brigade
XX	Division/Army AD Command

Symbol	Designation
XXX	Corps
XXXX	Army
XXXXX	Army Group
	Unit
	Unit Headquarters
	Observation or Listening Post
	Logistical Unit
	Combat Service Support

UNIT DESIGNATION AND BASIC SYMBOL



WEAPON SYMBOLS

Basic

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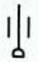
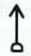
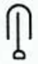
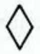
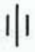
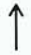
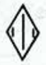
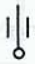
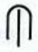
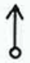
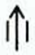
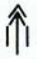
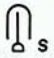
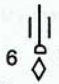
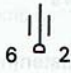
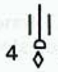
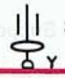
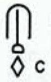
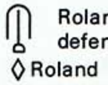
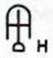
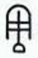
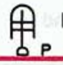
	Air Defense Gun
	Air Defense Machine Gun
	Air Defense Missile
	Armored Personnel Carrier
	Basic Artillery Gun
	Basic Infantry Weapon

Symbol	Description
	Full-tracked Armored Assault Gun
	Howitzer
	Missile/Rocket
	Mortar
	Recoilless Rifle
	Rocket Launcher

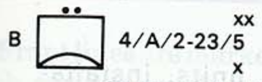
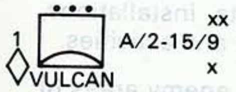
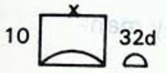
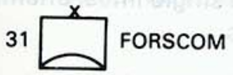
Air Defense Artillery

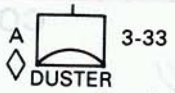
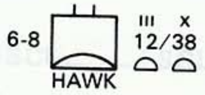
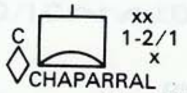
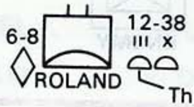
Symbol	Description
	Stinger
	Vulcan SP 20 (caliber/mm) No. of Systems
	Vulcan (towed) 20
	M42 (Duster) 40-mm
	Sgt York Gun

Symbol	Description
	Chaparral (full tracked air defense missile system)
	Roland (M812A1 5-ton Truck) air defense missile system
	Hawk (medium air defense missile system)
	Nike Hercules (heavy air defense missile system)
	Patriot

WEAPON SYMBOLS (CONTINUED)

ADA Unit symbols

Symbol	Description
	Section B, 4th Plt, A Btry 2d Bn 13rd ADA Inf Division
	1st Plt, A Btry Vul Sp. 2d Bn. 15th ADA, 9th Inf Division
	10th ADA Bde, 32d Army Air Defense Command
	31st ADA Bde. US Army Forces Command

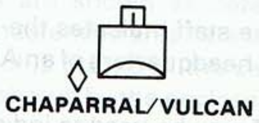
Symbol	Description
	Btry A, M42 Duster Sp, 3d Bn, 33d ADA
	6th Bn Hawk, 8th ADA, 12th ADA Gp, 38th ADA Bde
	Btry C, Chap SP, 1st Bn 2d ADA, 1st Inf Div
	This symbol indicates strictly an ADA command element.

Note: For other type ADA units delete Hawk, Chaparral, Vulcan, etc.; replace with applicable identifier; e.g., Hercules, Warhead Support, etc.

TEMPORARY GROUPING OF UNITS

The symbol ⊓ placed over the size of a unit indicates a temporary grouping of units, usually for a specific tactical operation and in which the shown unit functions as the command or controlling element.

EXAMPLE:



ADA Composite Battery C/V. This is a temporary mixing of weapons for an air defense in a specific tactical situation.

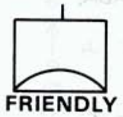
Note: When the correct symbol is not shown, a symbol may be made up, provided it is explained in a legend added to the map or overlay being drawn.

MAPS AND OVERLAYS

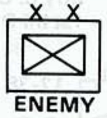
Maps and overlays use military symbols to show plans, orders, and information concerning specific or general military situations. The following methods are those most frequently used in making overlays and situation maps.

COLORS

BLUE or BLACK	Friendly units, installations, equipment, and activities.
RED	Enemy units, installations, equipment, and activities.
YELLOW	Friendly or enemy areas of chemical, biological, or radiological contamination.
GREEN	Friendly or enemy manmade obstacles.



FRIENDLY

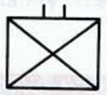


ENEMY

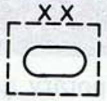
If only one color is available, friendly symbols are outlined with single lines; enemy symbols with double lines.

LINES AND LOCATIONS

Unit and installation symbols are drawn with either solid or broken lines.

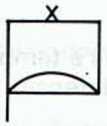


A solid line symbol represents a present or actual location.

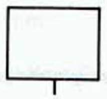


A broken line symbol indicates a future or projected location.

The center of the symbol indicates the general location of the unit or installation. To indicate precise locations, use the following:



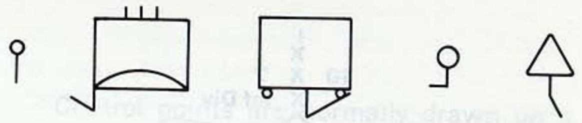
The base of the staff indicates the precise location of the headquarters of an ADA brigade.



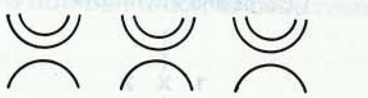
A central staff may be used to indicate the precise location of a unit or activity other than the headquarters symbol.

LINES AND LOCATIONS (CONTINUED)

The staff may be extended or bent as required to avoid cluttering symbols. This type of offset is used when units and activities are located close together.



Front lines are marked by a series of lines which curve away from opposing forces. If one color is used, enemy lines are represented by double lines.



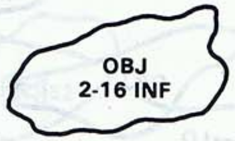
Control or coordination lines are solid or broken lines usually drawn perpendicular to the direction of advance.

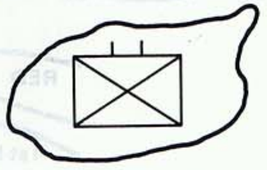
FSCL ——— FSCL	Fire Support Coordination Line
LD ——— LD	Line of Departure
LD/LC ⌒⌒⌒ LD/LC	Line of Departure is line of contact
PL ——— PL GREEN GREEN	Phase line with code name
NFL .... NFL	No Fire Line
PLD .... PLD	Probable Line of Deployment
FCL ——— FCL	Fire Coordination Line

OBJECTIVES AND AREAS

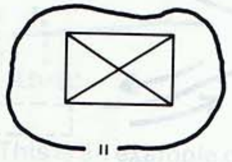
An overlay normally shows objectives for only those units under control of the headquarters issuing the plan or order. Each objective is identified by a solid-line "goose egg" containing the abbreviation "OBJ" and a designator.

Areas are shown as defended or undefended. Undefended areas are enclosed and the unit symbol is placed in the center. Defended areas are shown by the enclosed line broken by the unit size symbol.



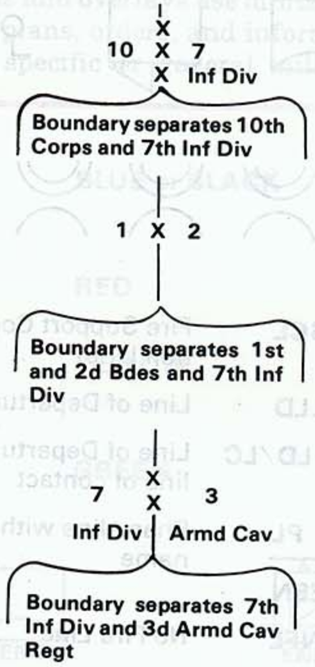


Assembly Area



Defense Position

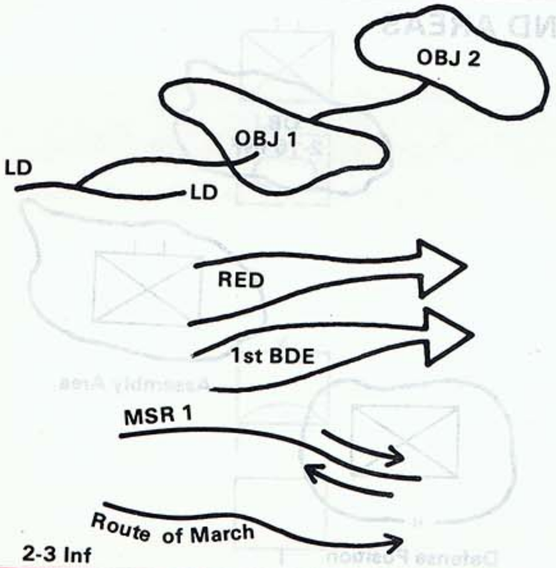
BOUNDARIES


10 X 7
X Inf Div
Boundary separates 10th Corps and 7th Inf Div
1 X 2
Boundary separates 1st and 2d Bdes and 7th Inf Div
7 X 3
Inf Div Armd Cav
Boundary separates 7th Inf Div and 3d Armd Cav Regt

Boundaries are marked by a solid line with the size indication of the unit shown at convenient intervals.

In the defense, lateral boundaries extend beyond the objective to enable fires and other actions to be coordinated. In the defense, lateral boundaries normally extend forward to limit of the command's area of influence. If practicable, boundaries are based on definable terrain features. Rear boundaries are habitually shown for divisions and higher levels. Proposed boundaries are shown by dotted lines.

DIRECTION OF ATTACK, AXIS OF ADVANCE, AND ROUTES OF MARCH

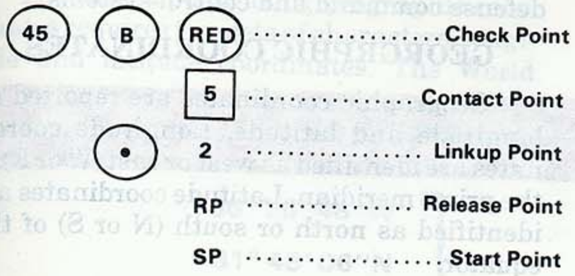


A direction of attack arrow is used to specify the direction of the main attack of a subordinate unit and extends only as far as this type control is needed. A direction of attack arrow is not labeled.

An axis of advance indicates the general direction of advance of a unit. An axis of advance may be identified by a code name or by the designation of the unit that is to use it.

Routes of march are shown by arrows and are labeled with the word route, their purpose, and/or code name or unit designation.

CONTROL POINTS

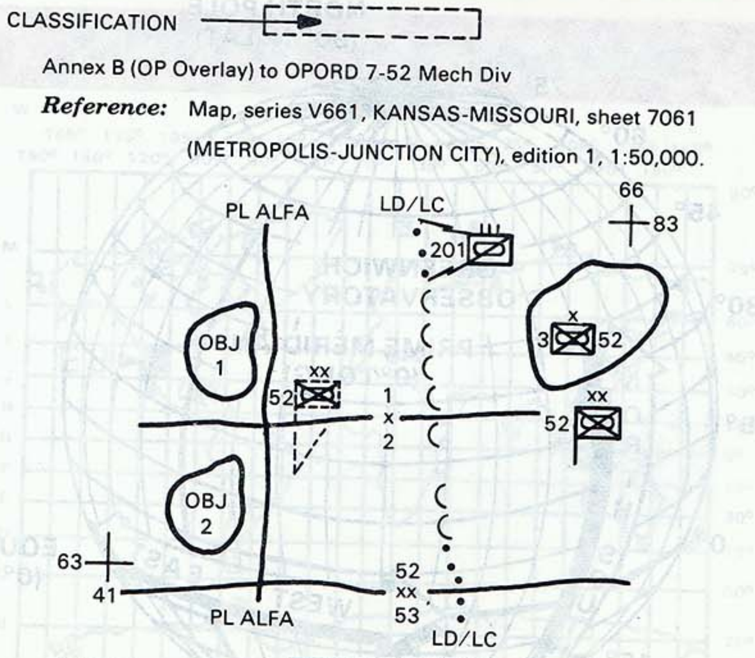


Control points are normally drawn on a selected, conspicuous terrain feature and designated with a number, letter, or code name.

COORDINATING POINTS

FEBA	⊗	Forward edge of the battle area
COP	⊗	Combat Outpost
GOP	⊗	General Outpost

OPERATION OVERLAY TO AN OPERATION ORDER


CLASSIFICATION
Annex B (OP Overlay) to OPORD 7-52 Mech Div
Reference: Map, series V661, KANSAS-MISSOURI, sheet 7061 (METROPOLIS-JUNCTION CITY), edition 1, 1:50,000.
PL ALFA
LD/LC
66
83
201
OBJ 1
xx
52
1
x
2
x
3
52
xx
52
OBJ 2
63
41
PL ALFA
52
xx
53
LD/LC
CLASSIFICATION

This is an example of an overlay issued with an operation order.

WORLD GEOGRAPHIC REFERENCE SYSTEM

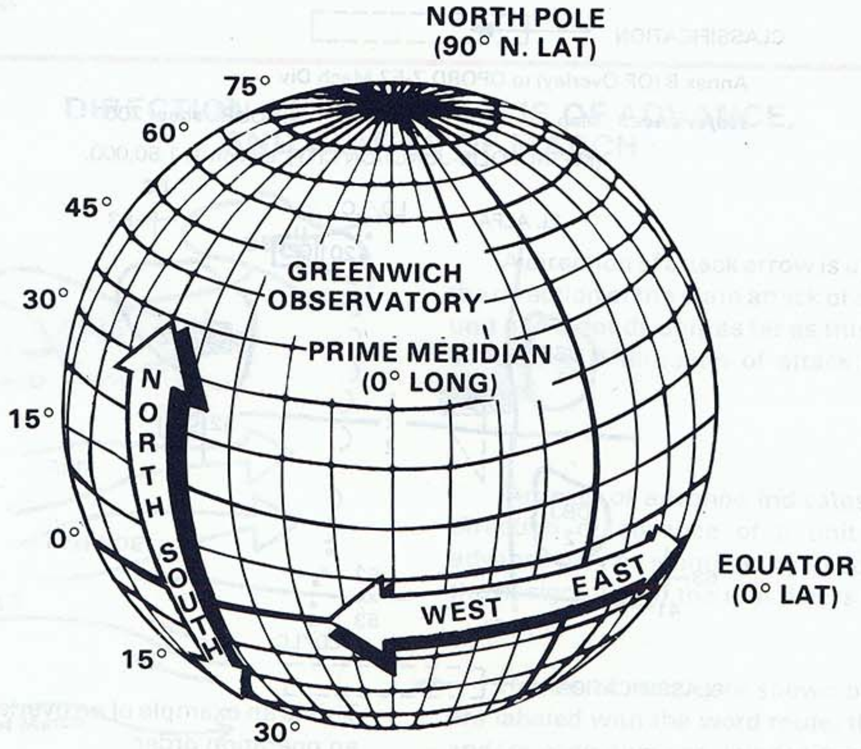
The World Geographic Reference System (GEOREF) is a worldwide position reference system that may be applied to any map or chart graduated in latitude and longitude regardless of projection. GEOREF is used in all joint air defense operations. Air defense artillery units use GEOREF on early warning plotting boards, on radar PPI screens, and for voice reporting target positions to air defense command and control systems.

GEORGRPHIC COORDINATES

Geographic coordinates are reported as longitude and latitude. Longitude coordinates are identified as west or east (W or E) of the prime meridian. Latitude coordinates are identified as north or south (N or S) of the equator.

GEOGRAPHIC COORDINATES

121° 35′ 42″W 102° 21′ 53″E	**Longitude Coordinates**
51° 18′ 26″N 22° 36′ 49″S	**Latitude Coordinates**



To locate a point using geographic coordinates requires two sets of characters, longitude and latitude coordinates. The World Geographic Reference System (GEOREF) requires only one set of characters to locate the same point.

GEOGRAPHIC COORDINATES

106° 25′ 48″W
31° 48′ 06″N } **Latitude Coordinates (El Paso, TX)**

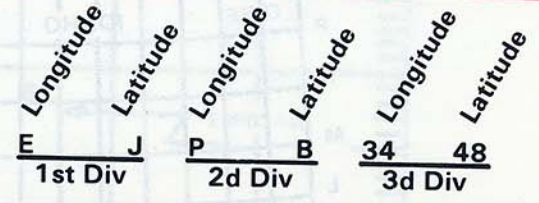
E J P B 3448) - GEOREF (El Paso, TX)

GEOREF COORDINATES

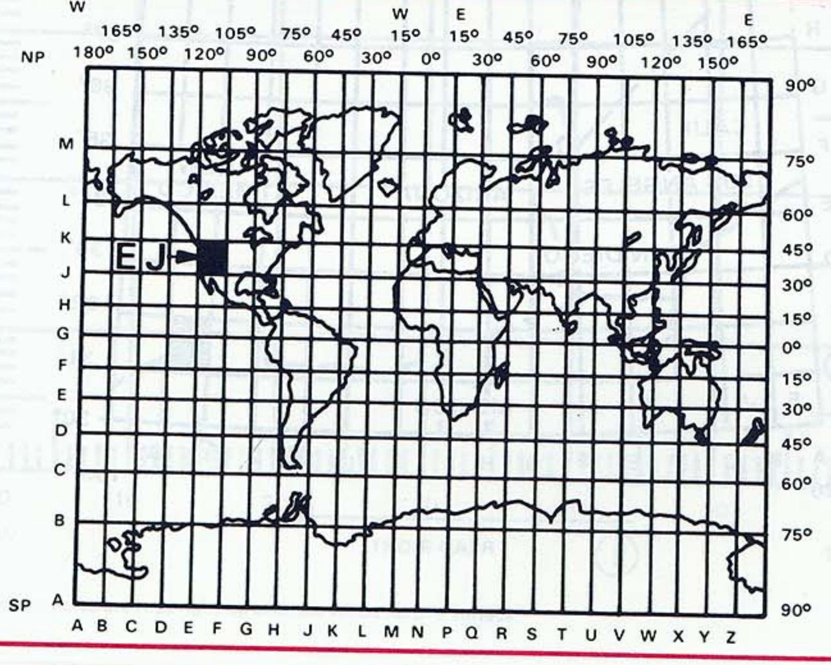
GEOREF coordinates are divided into three divisions called: first, second, and third division GEOREF. The longitude element always comes first.

The first division of GEOREF divides the surface of the earth into 24 longitudinal zones of 15° each and 12 latitudinal bands of 15° each.

DIVISIONS OF GEOREF

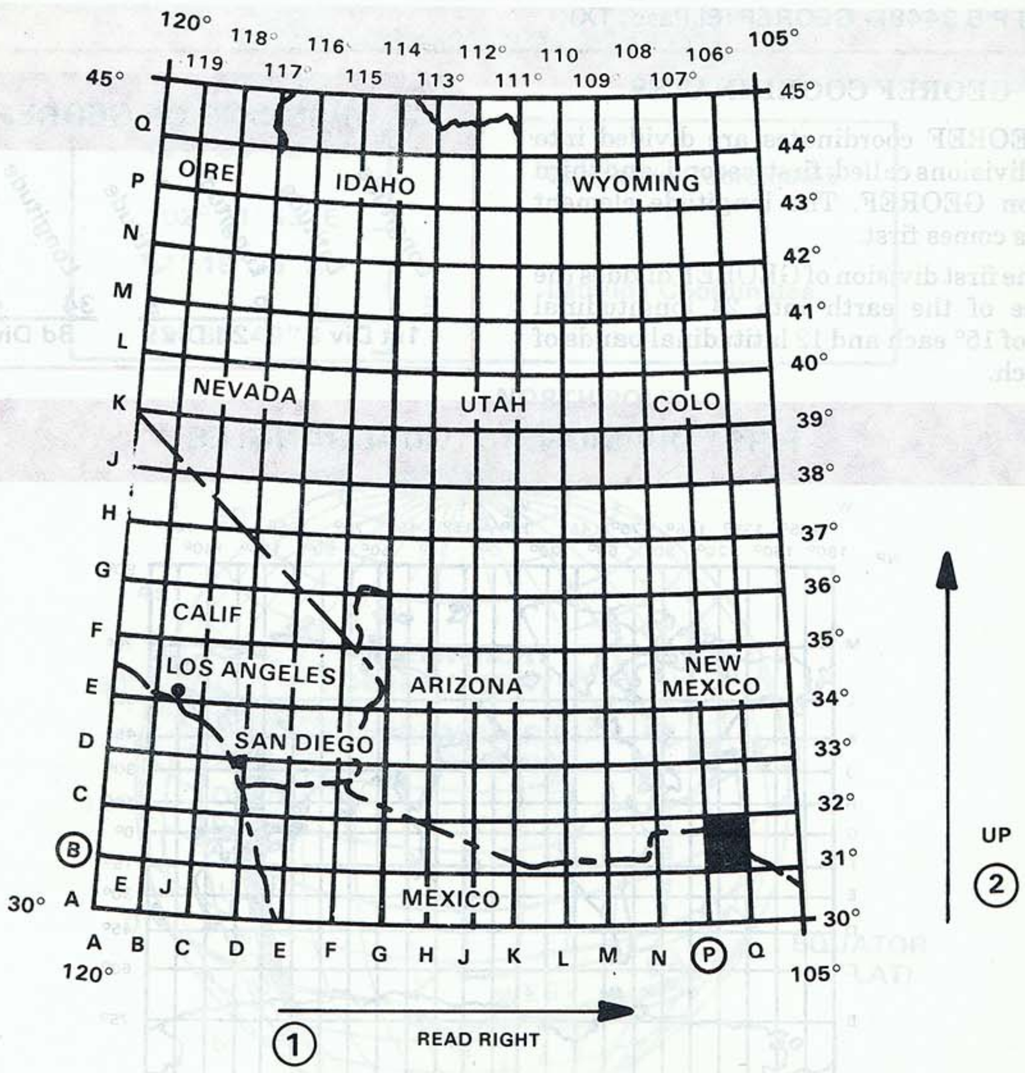


FIRST DIVISION, 15° QUADRANGLES



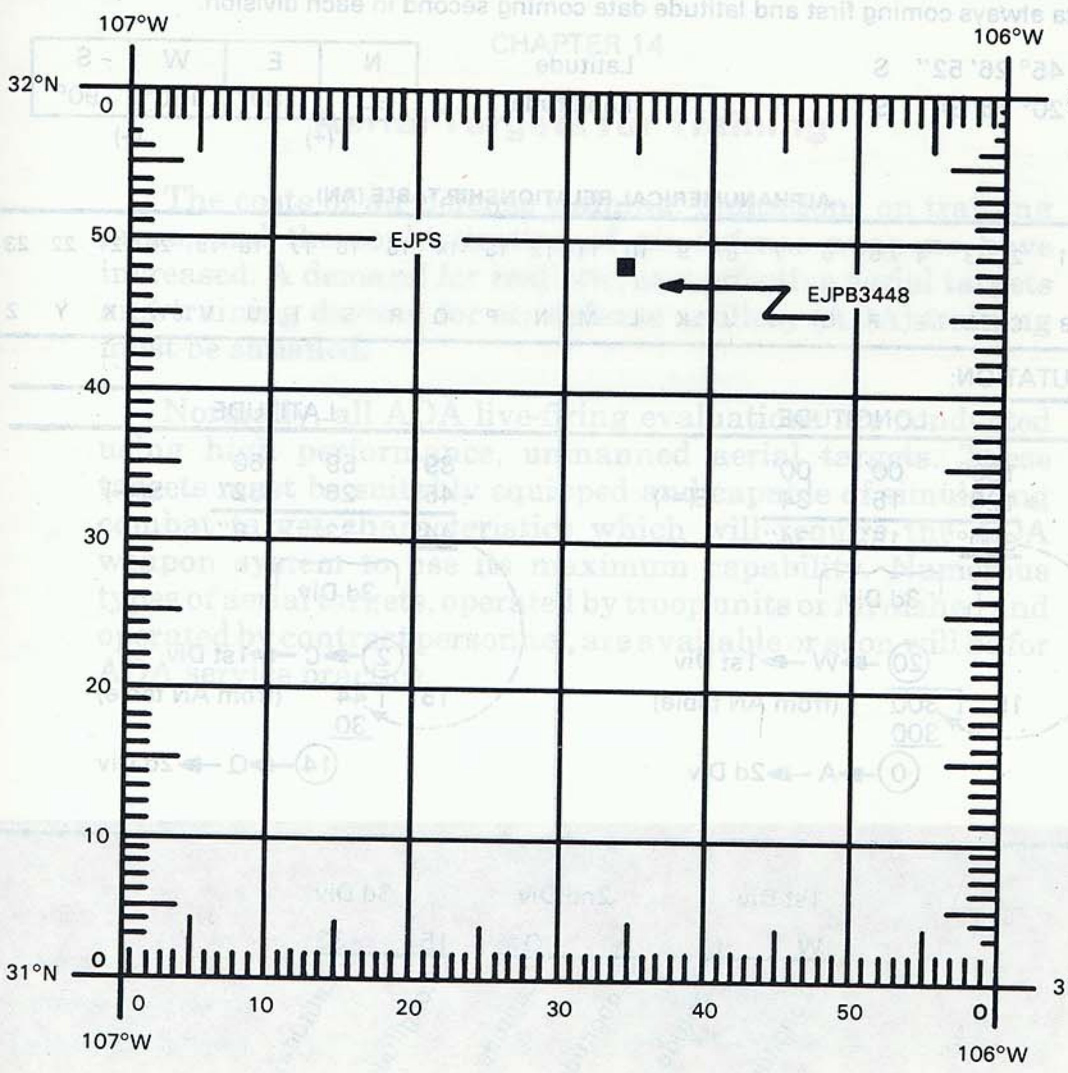
In the second division the 15° quadrangle (first division) designated by the first two letters of the GEOREF code is subdivided into 225 quadrangles formed by 15 longitudinal zones and 15 latitudinal bands each 1° wide.

SECOND DIVISION 1° QUADRANGLES



In the third division the 1°, second division, quadrangle is divided into 60 longitudinal zones of 1' east and west and 60 latitudinal bands of 1' north or south to make 3,600 third division (1°) quadrangles.

THIRD DIVISION: 1° QUADRANGLES



Note: GEOREF coordinates are read right-up over the whole earth's surface.

CONVERTING GEOGRAPHIC COORDINATES TO GEOREF

A simple way of changing coordinates of longtitude and latitude into GEOREF coordinates is by the use of the NEWS (north, east, west, south) rule and the alphanumerical relationship table. For detailed information on GEOREF, see TC 44-1-4.

CONVERTING GEOGRAPHIC COORDINATES TO GEOREF

Information must be obtained from both the longitude and latitude coordinates. Hence the NEWS rule and division must be performed on both sets of coordinates with longitude data always coming first and latitude data coming second in each division.

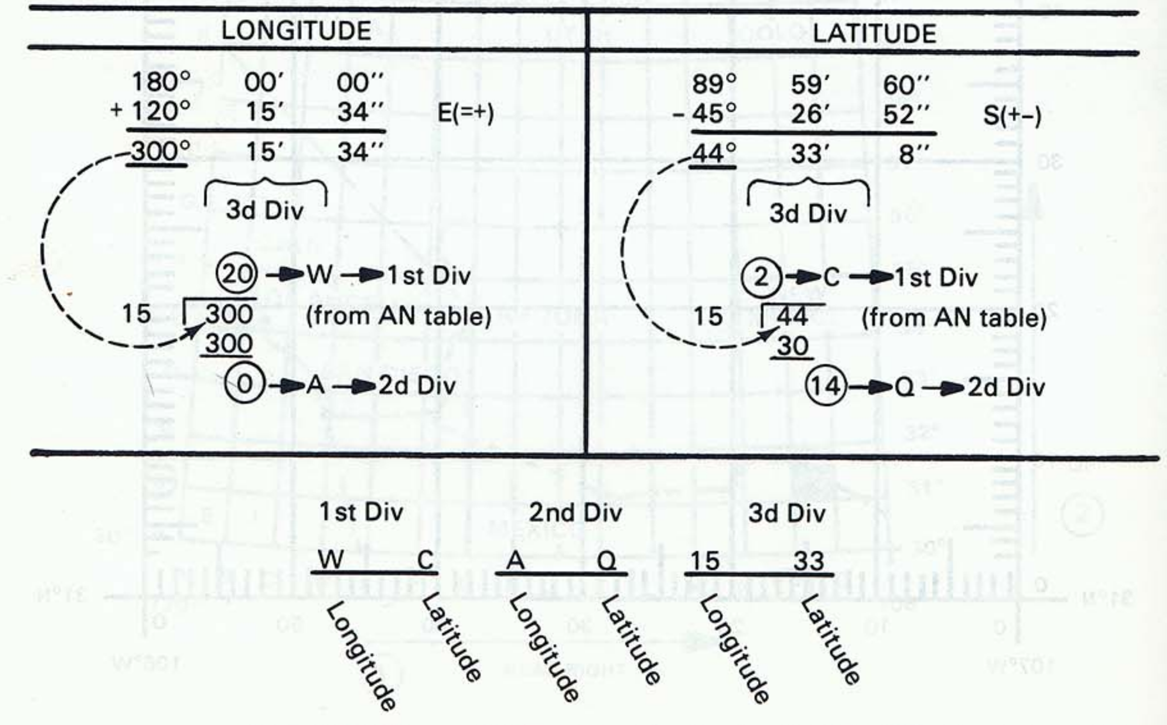
45° 26′ 52″ S Latitude
120° 15′ 34″ S Longitude

N	E	W	S
90°	180°	180°	90°
(+)		(−)	

ALPHANUMERICAL RELATIONSHIP TABLE (AN).

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
A	B	C	D	E	F	G	H	J	K	L	M	N	P	Q	R	S	T	U	V	W	X	Y	Z

COMPUTATION:



The GEOREF coordinates are: W C A Q 15 33

CHAPTER 14

Aerial Targets for Training

The costs of air defense training, limitations on training areas, and the sophistication of air defense weapons have increased. A demand for realistic, cost-effective aerial targets and training devices for air defense artillery (ADA) training must be satisfied.

Normally, all ADA live-firing evaluations are conducted using high performance, unmanned aerial targets. These targets must be suitably equipped and capable of simulating combat target characteristics which will require the ADA weapon system to use its maximum capability. Numerous types of aerial targets, operated by troop units or furnished and operated by contract personnel, are available or soon will be for ADA service practice.

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MQM-34D (FIREBEE)	14-2
BALLISTIC AERIAL TARGET SYSTEMS	14-3
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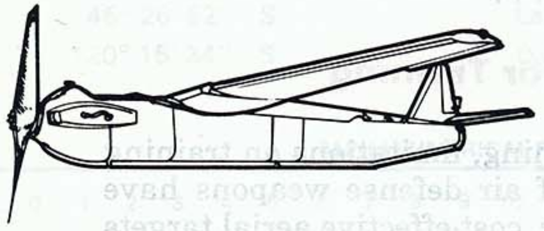
RADIO-CONTROLLED MINIATURE AERIAL TARGET	14-4
NEW TARGET DEVICE	14-5
RCMAT (MiG-27 CONFIGURATION)	14-6

RCAT MQM-33 (OO-19)

The RCAT MQM-33 (OO-19) light target missile (Creeper) is a high-wing monoplane controlled remotely by radio and powered by a four-cylinder, two-cycle, air-cooled engine. The target system is used for training and evaluation of the M42 (Duster). Stocks of this target are low and are used by the National Guard only.

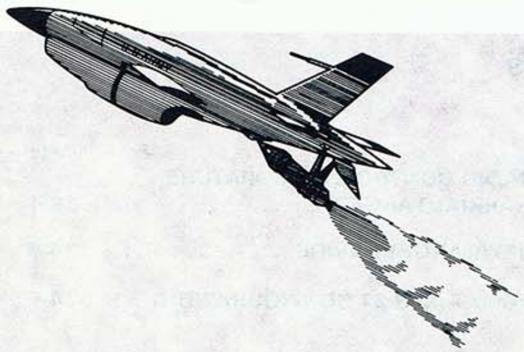


DATA SUMMARY

Launch	Ground launched by jet assisted takeoff (JATO) zero-length launcher.
Power Plant	72 hp, four-cylinder, air-cooled engine.
Guidance	Auto pilot and command guidance.
Recoverability	Recoverable by parachute.
Performance	Maximum speed--206 knots. Altitude--up to 23,000 feet. Endurance--maximum 68 minutes.

MQM-34D (FIREBEE)

The MQM-34D (Firebee) is a mid-wing, high-speed, remotely controlled target missile. The missile is propelled by a single turbojet engine. During flight, it can execute all normal flight maneuvers, and is recoverable by a parachute recovery system. The mission of the MQM-34D is to support training and evaluation of air defense artillery personnel. This target is used in research and development only.



DATA SUMMARY

Launch	Ground launched from zero-length launcher using JATO.
Power Plant	Turbojet engine with 1,700 lb maximum thrust.
Guidance	Command guidance.
Recoverability	Recoverable by parachute.
Performance	Speed--500 knots. Altitude--100 to 61,000 feet. Endurance--90 minutes.

BALLISTIC AERIAL TARGET SYSTEM

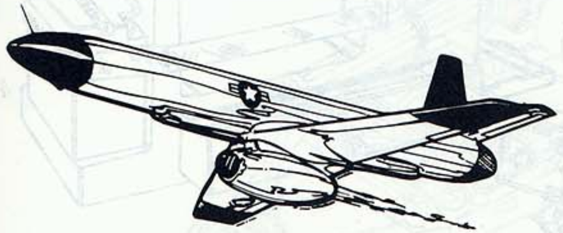
The ballistic aerial target system (BATS) is a low-cost, one-flight, expendable target for ADA training and service practice. It is completely troop operated. BATS is used in support of Vulcan, Chaparral, and Redeye training.

DATA SUMMARY

Launch	Ground launched from three-point slide with 0-45° launching elevation.
Power Plant	Two to five 2.75-inch rocket motors: two jet engine starter cartridges as sustainers.
Guidance	None (ballistic aimed).
Recoverability	Nonrecoverable.
Performance	Speed--275-550 knots. Altitude--8,000 feet maximum. Endurance--47 seconds.

VARIABLE SPEED TRAINING TARGET

The variable speed training target (VSTT) (MQM-107) (Streaker) provides the altitude, speed, and maneuver capability required for supporting annual service practice (ASP) for Hawk units. It is air-transportable, a feature that allows for maximum target support to Hawk units deployed world-wide.



The Streaker can be fitted with devices which provide simulated radar and infrared signatures of actual aircraft and missiles. A 2 x 12-foot banner is being used for aerial gunnery practice. It is towed by the MQM-107 (Streaker) drone. Scoring is accomplished by a scoring device.

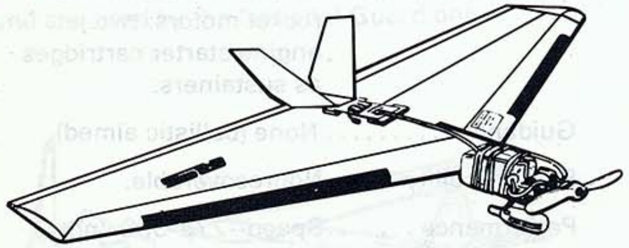
DATA SUMMARY

Launch	Ground launch by zero-length launcher.
Power Plant	Turbojet.
Guidance	Digital command-telemetry readouts.
Recoverability	By parachute.
Performance	Speed--250-500 knots. Altitude--100-12,200 meters. Endurance--47 minutes.

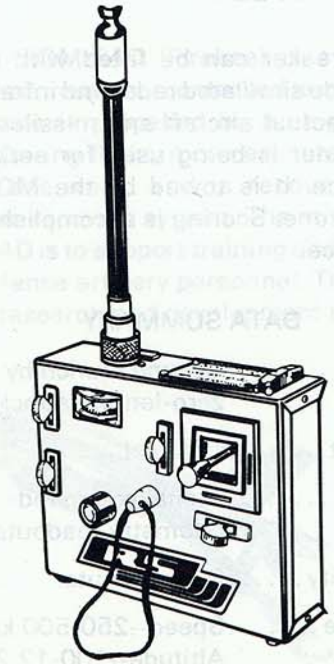
RADIO-CONTROLLED MINIATURE AERIAL TARGET

The US Army's FQM-117A radio-controlled miniature aerial target (RCMAT) is a small-scale, visually guided, radio-controlled target that provides an accurate representation of a full-scale aircraft for training. When flown at 1/6 the distance of an actual aircraft, the target simulates the speed, maneuverability, attack profile, and radar signature of the aircraft.

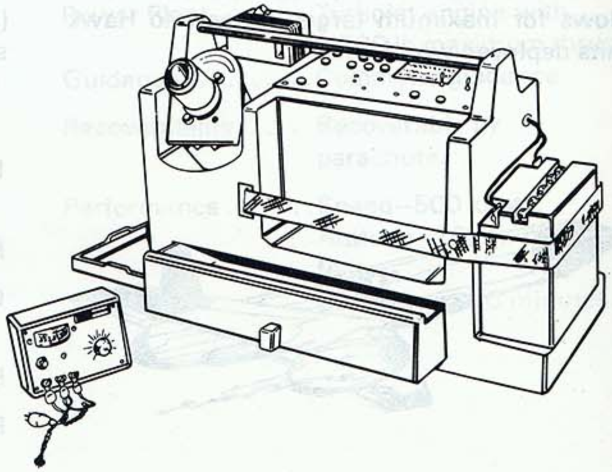
The FQM-117A is made of fiberboard-covered plastic foam with aluminum components to enhance radar detection. The target uses a methanol/oil/nitromethane mixture as fuel, which can sustain flight up to 20 minutes at speeds of (92 mph/148 kmph). The system consists of the airframe, a hand-held transmitter, and related ground support equipment. It is portable, troop operated. The system does not require dedicated transportation, storage, or maintenance facilities. No special tools or hardware are needed to assemble the target, and a prepared range or recovery site is not necessary.



RCMAT AIRFRAME



HAND-HELD TRANSMITTER



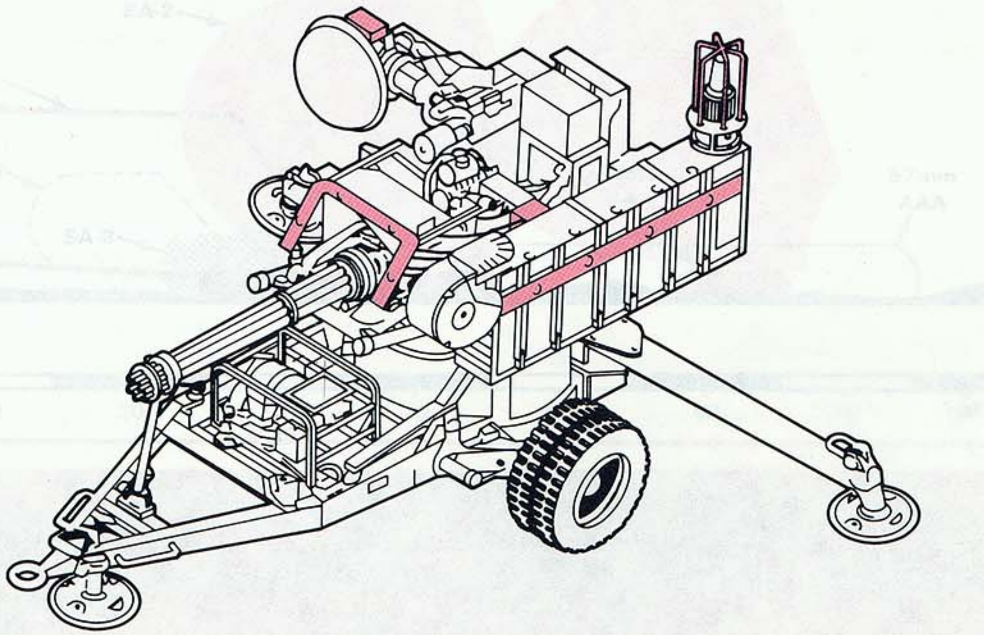
GROUND SUPPORT EQUIPMENT

NEW TARGET DEVICE

The Multiple Integrated Laser Engagement System Air Ground Engagement Simulation/Air Defense (MILES AGES/AD) system is scheduled for fielding in the FY 84-FY 85 timeframe. The MILES AGES/AD system consists of a family of different training devices. MILES/AGES AD equipment will be used primarily in conjunction with Chaparral, Vulcan, and Stinger training. The system will also be used with the OH-58, UH-1, and the AH-1 helicopters for training purposes.

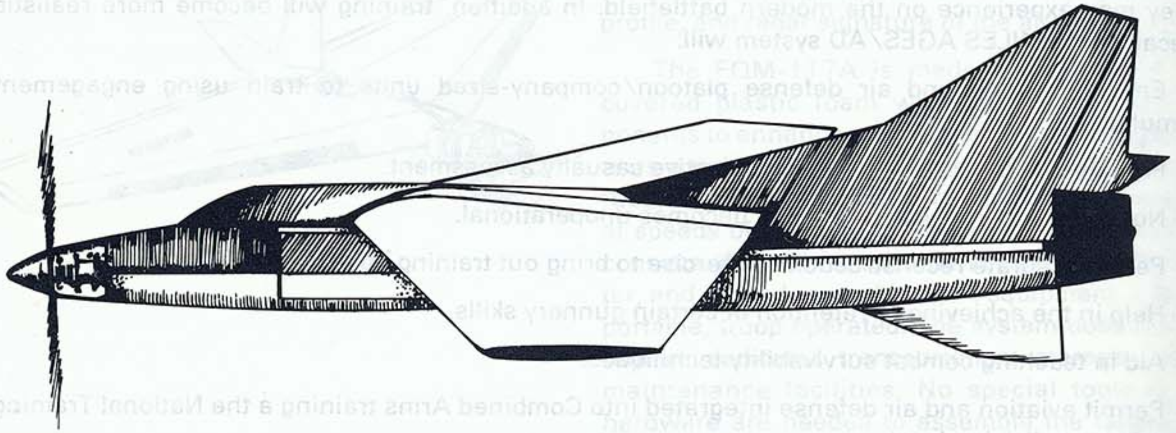
The MILES AGES/AD system will provide soldiers with a training environment similar to what they may experience on the modern battlefield. In addition, training will become more realistic because the MILES AGES/AD system will:

- Enable aviation and air defense platoon/company-sized units to train using engagement simulations.
- Provide automatic, accurate, and objective casualty assessment.
- Not operate if the weapon system becomes unoperational.
- Permit accurate reconstruction of exercise to bring out training objectives.
- Help in the achieving or retention of certain gunnery skills.
- Aid in teaching combat survivability techniques.
- Permit aviation and air defense integrated into Combined Arms training a the National Training Center on a division level.
- Provide an opportunity for crew coordination in a simulated combat environment.



RCMAT (MiG-27 CONFIGURATION)

The FQM-117A has proven to be very useful in air defense training, but it has been determined that an improved target (MiG-27 Configuration) more representative of threat aircraft should be fielded. Specifications have been prepared for a new target which will present an approximate 1/9 scale, representations of jet combat aircraft. Award of contract for the new RCMAT is anticipated by early FY 1984.



CHAPTER 15

Soviet Air Defense Guns and Weapons

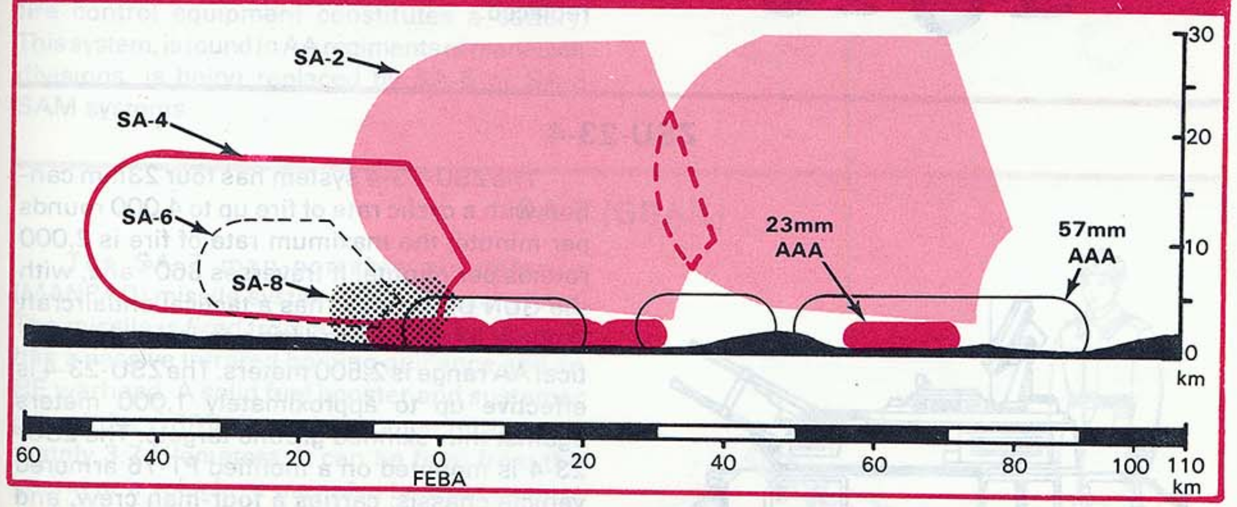
Soviet forces have a great number of mobile surface-to-air missiles and conventional air defense guns for air defense of their field units. This mix of guns and missiles provides a mobile umbrella which accompanies each echelon of Soviet armies, and forward deployed battalions. As new air defense systems come into the Soviet forces, the older systems are still retained in the active weapon inventory for their use or for use by Soviet block countries. For unclassified information on this subject refer to FM 100-2-3, Soviet Army Troops Organization and Equipment.

SOVIET ARMY AIR DEFENSE ENVELOPE

The Soviet Army air defense envelope does not include air defense weapons of maneuver regiments and lower echelons.

Air defense weapons that are included are shown below in the illustration.

THE SOVIET ARMY AIR DEFENSE ENVELOPE



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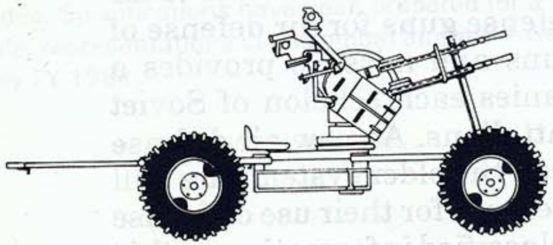
SOVIET AIR DEFENSE WEAPONS 15-2
Page
SOVIET GUN/MISSILE SYSTEMS 15-6

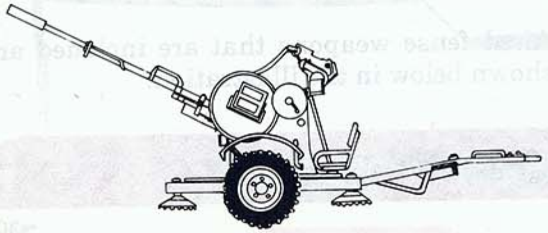
SOVIET AIR DEFENSE WEAPONS

ZPU-4



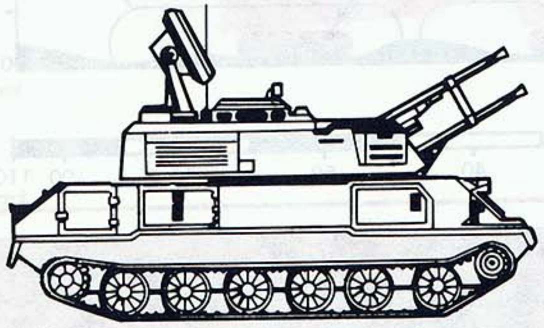
The ZPU-4 has four 14.5mm heavy machineguns with a combined cyclic rate of fire of 2,200 to 2,400 rounds per minute. It traverses 360° and with its optical fire control has a tactical AA range of 1,400 meters. It is being replaced.

ZU-23



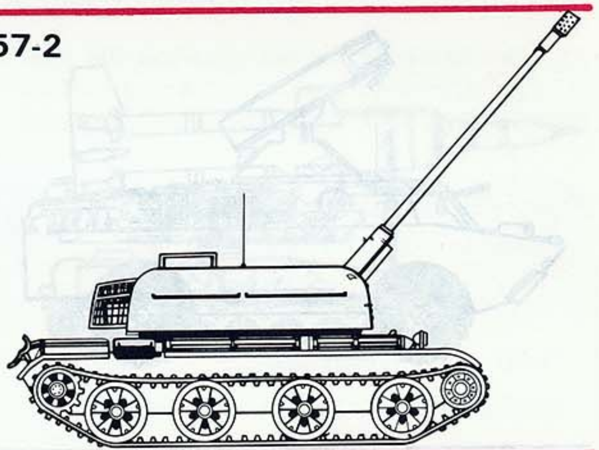
The ZU-23 system consists of two 23mm cannons, which in the cyclic mode fires a maximum of 2,000 rounds per minute. The ZU-23 traverses 360° and with its optical fire control has a AA range of 2,500 meters. Against thin-skinned armor targets, it has a ground combat range of approximately 1,000 meters. It is being replaced.

ZSU-23-4



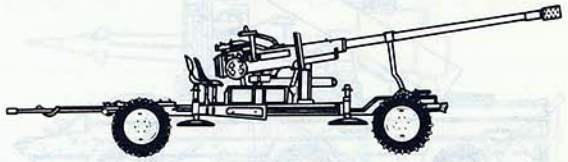
The ZSU-23-4 system has four 23mm cannon with a cyclic rate of fire up to 4,000 rounds per minute; the maximum rate of fire is 2,000 rounds per minute. It traverses 360° and, with the GUN DISH radar, has a tactical antiaircraft range of 3,000 meters. Using optical sights, tactical AA range is 2,500 meters. The ZSU-23-4 is effective up to approximately 1,000 meters against thin-skinned ground targets. The ZSU-23-4 is mounted on a mofified PT-76 armored vehicle chassis, carries a four-man crew, and can fire on the move at speeds up to 25 kph. The ZSU-23-4 can be used with the SA-9 GASKIN. It is found in tank and motorized rifle regiments of tank and motorized rifle divisions. It is integrated into the attack formations.

ZSU-57-2



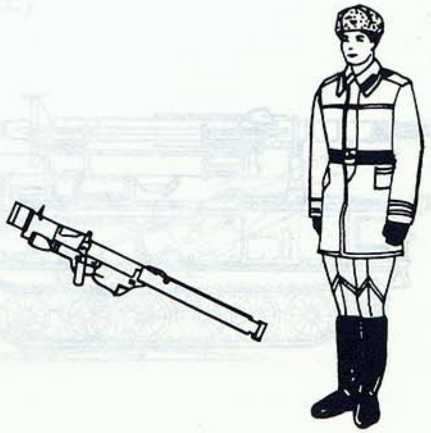
The ZSU-57-2 AA system has two 57mm cannons with a combined rate of fire of 210 to 240 rounds per minute. It traverses 360° and has a tactical range of 4,000 meters. The ZSU-57-2 is mounted on a modified T-54 tank chassis and carries a five-man crew. Fire control is optically directed. The ZSU-57-2 is being replaced. When found in maneuver units, it is normally located with tank regiments.

S-60



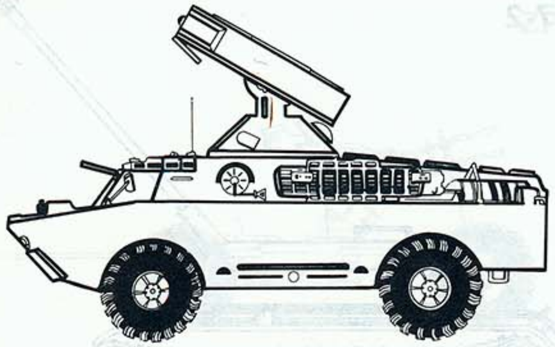
The S-60 AA system has one 57mm cannon with a cyclic rate of fire of 105 to 120 rounds per minute. It traverses 360° and, when directed by the off-carriage FLAP WHEEL radar, has a tactical AA range of 6,000 meters. The tactical AA range with on-carriage optical sights is 4,000 meters. Six S-60 guns with associated fire control equipment constitutes a battery. This system, is found in AA regiments of maneuver divisions, is being replaced by SA-6 or SA-8 SAM systems.

SA-7 (GRAIL)



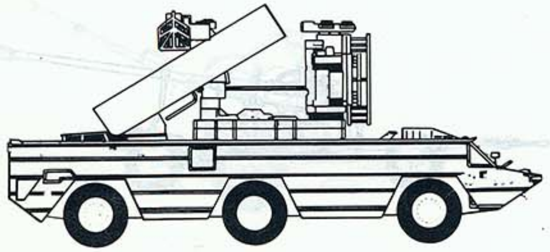
The SA-7 man-portable air defense (MANPAD) missile system is 1.42 meters long. The missile is fired from a shoulder launcher. It has a passive infrared homing guidance and an HE warhead. A solid fuel booster and sustainer propel the GRAIL to a slant range of approximately 3.7 kilometers. It can be fired from the gound or a vehicle. It may also be used against aircraft flying at altitudes from approximately 50m to 3,500m. Nine SA-7 GRAIL launchers are found in each tank and motorized rifle battalion and are further assigned in groups of three to company level.

SA-9 (GASKIN)



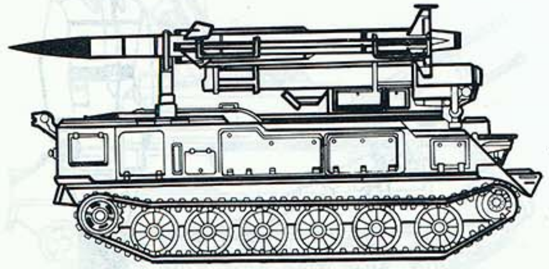
The SA-9 is a short-range air defense (SHORAD) system transported on a modified BRDM-2 amphibious armored vehicle with a crew of three. The SA-9 has a slant range of 5 kilometers and an altitude capability of about 5,000 meters. The missile has an infrared seeker, an HE warhead, and may be powered by a solid propellant. Four missile canisters, each with one missile, are normally carried on the launcher turret. The SA-9 GASKIN is used in conjunction with the ZSU-23-4 at regimental level.

SA-8 (GECKO)



The SA-8 SHORAD missile uses command guidance and is effective at altitudes from 50 to 10,000 meters. It is self-contained with acquisition, tracking, and two missile guidance radars mounted on a six wheel, amphibious vehicle. Four missiles are carried in an integrated mount. The system contains an electro-optical tracker, probably television. With a slant range of 10-15 kilometers, the mobile SA-8 can provide close support to armored and mechanized forces. The SA-8 is a new weapon system now being introduced into the threat inventory.

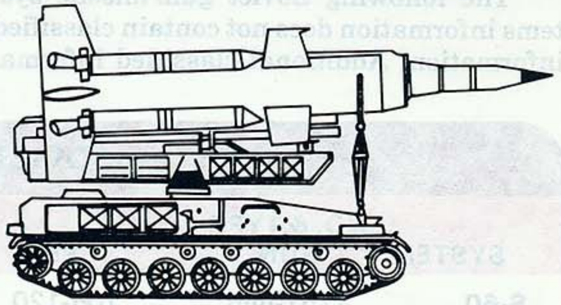
SA-6 (GAINFUL)



The SA-6 air defense missile has a slant range of about 24 kilometers. It is powered by an integral solid rocket/ramjet system and is command guided by the STRAIGHT FLUSH fire control radar. The missile carries an HE fragmentation warhead and can be employed against aircraft flying at altitudes from about 100 to 12,000 meters. This system was used effectively during the 1973 Middle East War. It may be assigned at army and division levels.

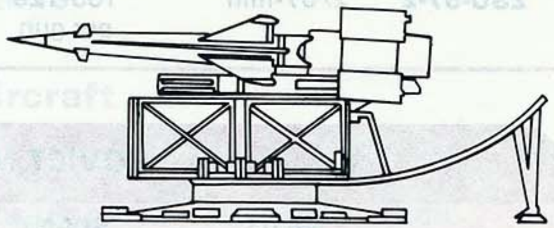
SA-4 (GANEF)

The SA-4 air defense missile has a slant range of approximately 70 kilometers. The GANEF has command guidance to a maximum altitude of about 27,000 meters. The missile is powered by four solid-fuel boosters with canted nozzles and a ramjet sustainer. It carries an HE proximity-fuzed warhead. The SA-4 system may be assigned at front or army level.



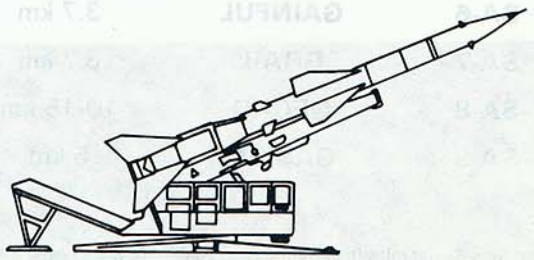
SA-3 (GOA)

The SA-3 air defense missile probably is command-guided. The missile has an effective slant range of about 20 kilometers. Powered by a two-stage solid-fuel booster and a solid-fuel sustainer, the missile can carry its HE proximity-fuze warhead to altitudes in excess of 25,000 meters. This system is assigned at front or army level.



SA-2 (GUIDELINE)

The SA-2 is a high- to medium-altitude air defense (HIMAD) missile that has a slant range of approximately 50 to 70 kilometers. It has two stages, a solid fuel booster and a liquid fuel rocket sustainer that boosts its 130 kilogram HE warhead to a maximum altitude of about 28,000 to 40,000 meters. The typical SA-2 site consists of six launchers arranged in a star-like configuration around the FAN SONG radar guidance equipment. The SA-2 system is assigned at front or army level.



SOVIET GUN/MISSILE SYSTEMS

The following Soviet gun/missile systems information does not contain classified information. Additional classified information is available through respective classified documents control unit officers.

SOVIET GUN SYSTEMS

SYSTEM	NO. & TYPE GUN	RPM	FIRE CONTROL	RANGE
S-60	1/57-mm	105-120	Radar/optical	6,000/4,000 m
ZU-23	2/23-mm	800-1000 per gun	Optical	2,500 m
ZPU-4	4/14.5-mm	600 per gun	Optical	1,400 m
ZSU-23-4	4/23-mm	800-1000 per gun	Radar/optical	3,000/2,500 m
ZSU-57-2	2/57-mm	105-120 per gun	Optical	4,000 m

SOVIET MISSILE SYSTEMS*

SYSTEM	NATO NAME	SLANT RANGE	ALTITUDE	WARHEAD
SA-2	GUIDELINE	50 to 70 km	28,000 to 40,000	HE
		20 km	25,000 m	HE
S-4a SA-43	GANEF	80 to 100 km	25,000 m	HE
SA-6	GAINFUL	3.7 km	100 to 1200 m	HE
SA-7	GRAIL	3.7 km	50-3,500 m	HE
SA-8	GECKO	10-15 km	50-10,000	HE
SA-9	GASKIN	5 km	5,000 m	HE

*New Soviet missile systems, such as SA-10, SA-11, and SA-12, will in time replace some of the above listed systems.

CHAPTER 16

Threat Aircraft

This chapter contains illustrations and a brief description of a number of Threat aircraft. Additional unclassified aircraft information on this subject is contained in FM 44-30, Visual Aircraft Recognition, and FM 44-1, Air Defense Artillery Employment. For classified information in Threat aircraft, classified Threat documents should be consulted.

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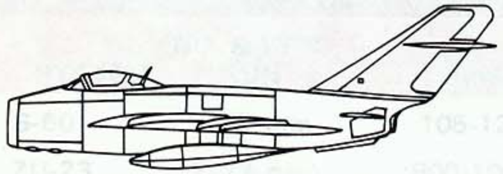
MULTIROLE ATTACK AIRCRAFT

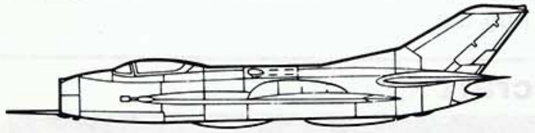
Multirole attack aircraft are shown below and on the following pages.

MiG-17 FRESCO



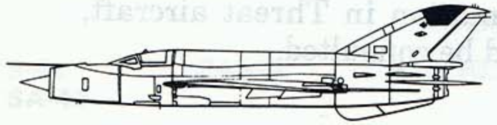
TYPE: FIGHTER/INTERCEPTOR/GROUND ATTACK
MAXIMUM SPEED: 1,145 km/hr AT ALTITUDE
1,125 km/hr AT SEA LEVEL
COMBAT RADIUS: 500, 700 km
REMARKS: MAY CARRY A VARIETY OF GROUND ATTACK AND AIR- TO-AIR WEAPONS.

MiG-19 FARMER



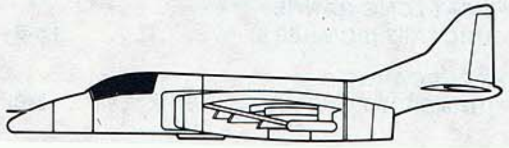
TYPE: FIGHTER/GROUND ATTACK
MAXIMUM SPEED: 1,450 km/hr AT ALTITUDE
UNKNOWN km/hr AT SEA LEVEL
COMBAT RADIUS: 685 km
REMARKS: MAY CARRY A WIDE VARIETY OF GROUND ATTACK WEAPONS.

MiG-21 FISHBED



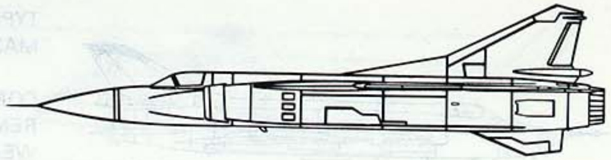
TYPE: FIGHTER[1, 2, 3]
MAXIMUM SPEED: 2,250 km/hr AT ALTITUDE
1,350 km/hr AT SEA LEVEL
COMBAT RADIUS: 650 km
REMARKS: MAY CARRY A WIDE VARIETY OF GROUND ATTACK AND AIR-TO-AIR WEAPONS.

Su-25 FROG FOOT



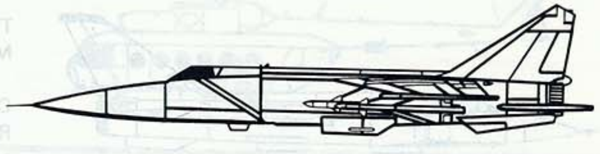
TYPE: GROUND SUPPORT FIGHTER
MAXIMUM SPEED: SUBSONIC - POSSIBLY MACH 0.9
COMBAT RADIUS: APPROXIMATELY 1,000 km
REMARKS: PERFORMS MISSIONS SIMILAR TO THE US A-10. DESIGNED TO PROVIDE CLOSE AIR SUPPORT TO GROUND FORCES.

MiG-23 FLOGGER



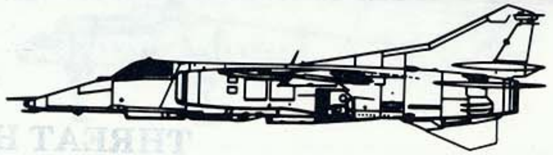
TYPE: FIGHTER/INTERCEPTOR[2, 3]
MAXIMUM SPEED: 2,445 km/hr AT ALTITUDE
1,350 km/hr AT SEA LEVEL
COMBAT RADIUS: 965 km
REMARKS: HAS A VARIABLE WING AND MAY CARRY AIR-TO-AIR MISSILES.

MiG-25 FOXBAT



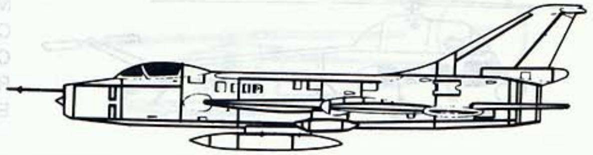
TYPE: FIGHTER/INTERCEPTOR[2, 3]
MAXIMUM SPEED: 2,865 km/hr AT ALTITUDE
UNKNOWN km/hr AT SEA LEVEL
COMBAT RADIUS: 1,130 km
REMARKS: MAY CARRY AIR-TO-AIR WEAPONS.

MiG-27 FLOGGER D



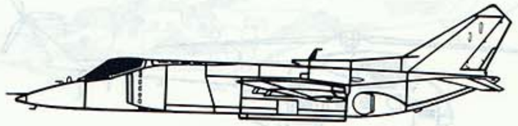
TYPE: FIGHTER/INTERCEPTOR[1]
MAXIMUM SPEED: 1,700 km/hr AT ALTITUDE
1,300 km/hr AT SEA LEVEL
COMBAT RADIUS: 900 km
REMARKS: HAS A VARIABLE WING SYSTEM AND MAY CARRY A WIDE RANGE OF GROUND ATTACK WEAPONS, INCLUDING AIR-TO- SURFACE MISSILES.

Su-7B FITTER



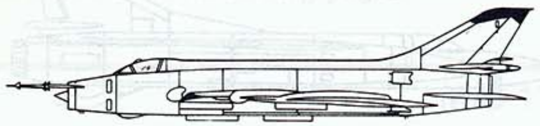
TYPE: GROUND ATTACK[1, 2]
MAXIMUM SPEED: 1,930 km/hr AT ALTITUDE
850 km/hr AT SEA LEVEL
COMBAT RADIUS: 320-485 km
REMARKS: MAY CARRY A VARIETY OF GROUND ATTACK WEAPONS, TO INCLUDE AIR-TO-SURFACE MISSILES.

Yak-36 FORGER



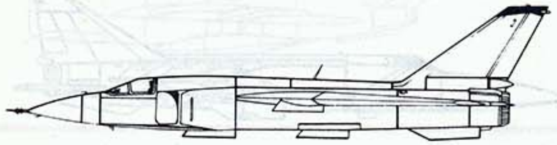
TYPE: LIGHT VTOL SHIPBOARD STRIKE FIGHTER
MAXIMUM SPEED: 1,046 km TO 1,287 km/hr
COMBAT RADIUS: UNKNOWN
REMARKS: FOUR EXTERNAL PYLONS, 2,200 lbs OF STORES. ALSO, AA-8 (APHID) AIR-TO-AIR MISSILE AND GUN PODS.

Su-17/20/22 FITTER



TYPE: GROUND ATTACK[1]
MAXIMUM SPEED: 2,305 km/hr AT ALTITUDE
1,285 km/hr AT SEA LEVEL
COMBAT RADIUS: 360-630 km
REMARKS: MAY CARRY A VARIETY OF GROUND ATTACK WEAPONS, INCLUDING AIR-TO-SURFACE MISSILES.

Su-24 FENCER



TYPE: FIGHTER/BOMBER/GROUND ATTACK
MAXIMUM SPEED: 2,655 km/hr AT ALTITUDE
1,530 km/hr AT SEA LEVEL
COMBAT RADIUS: 400-1200 km
REMARKS: MAY CARRY AIR-TO-AIR OR AIR-TO-SURFACE MISSILES AND HAS A VARIABLE WING.

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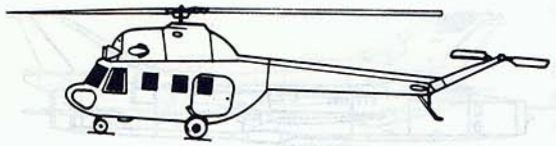
[1] Possible nuclear weapon delivery capability.
[2] Possible EW configuration.
[3] Possible reconnaissance capability.

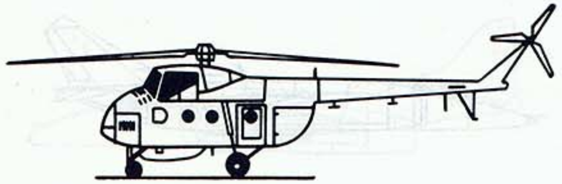
THREAT HELICOPTERS

Mi-2 HOPLITE



TYPE: UTILITY
MAXIMUM SPEED: 209 km/hr
CRUISING SPEED: 190 km/hr
CARGO: 700 kg (INTERNAL) 800 kg (EXTERNAL)
RANGE: 170-580 km
EQUIPPED TROOPS: 8-10[1]

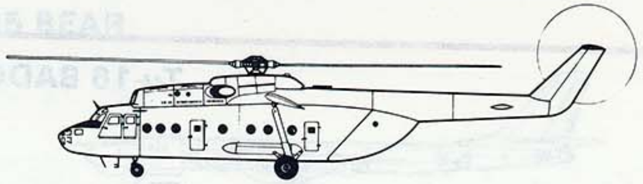
Mi-4 HOUND



TYPE: TRANSPORT AND GENERAL UTILITY
MAXIMUM SPEED: 213 km/hr
CRUISING SPEED: 177 km/hr
CARGO: 1,200 kg
RANGE: 274-463 km
EQUIPPED TROOPS: 12-16[1, 2, 3]

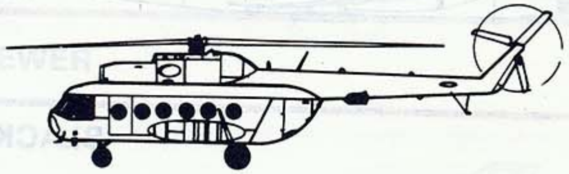
Mi-6 HOOK

TYPE: HEAVY TRANSPORT AND ASSAULT
MAXIMUM SPEED: 300 km/hr
CRUISING SPEED: 250 km/hr
CARGO: 12,000 kg (INTERNAL) 8,000 kg (EXTERNAL)
RANGE: 204-612 km
EQUIPPED TROOPS: 65[2, 3]



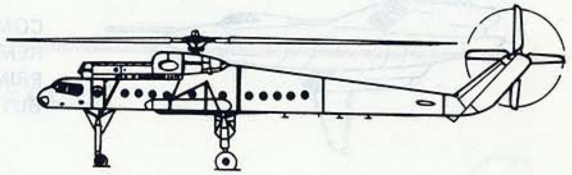
Mi-8 HIP

TYPE: MEDIUM TRANSPORT AND ASSAULT
MAXIMUM SPEED: 230 km/hr
CRUISING SPEED: 225 km/hr
CARGO: 4,000 kg (INTERNAL) 3,000 kg (EXTERNAL)
RANGE: 163-406 km
EQUIPPED TROOPS: 24[1, 2, 3]



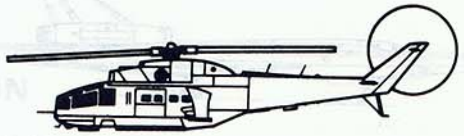
Mi-10 HARKE

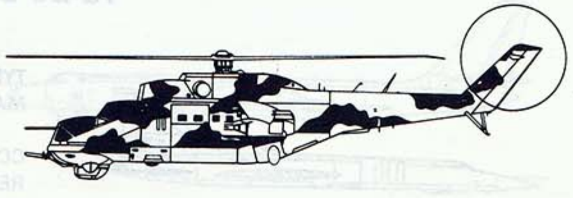
TYPE: HEAVY TRANSPORT AND ASSAULT
MAXIMUM SPEED: 200 km/hr
CRUISING SPEED: 180 km/hr
CARGO: 15,000 kg (INTERNAL) 8,000 kg (SLING)
RANGE: 135-567 km
EQUIPPED TROOPS: 28[2, 3]



Mi-24 HIND A, D

TYPE: ASSAULT
MAXIMUM SPEED: 320 km/hr
CRUISING SPEED: 310 km/hr
CARGO: 2,900 kg/UNKNOWN
RANGE: 491-537 km/PROBABLY SAME AS A
EQUIPPED TROOPS: 8





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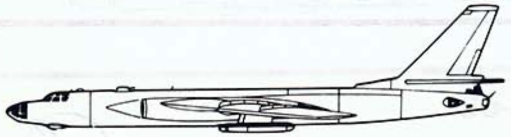
[1] Command raid.
[2] Airborne cavalry.
[3] Assault.

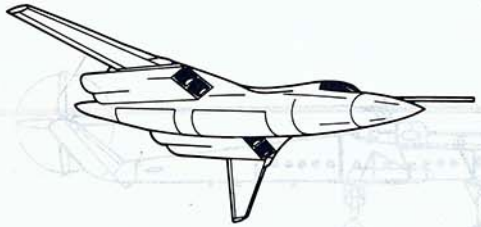
THREAT LONG-RANGE AIRCRAFT (BOMBERS)

Tu-16 BADGER



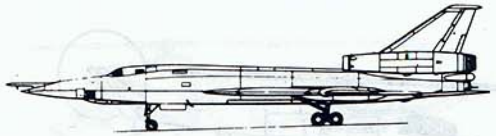
TYPE: STRATEGIC BOMBER[1, 3]
MAXIMUM SPEED: 1,175 km/hr AT ALTITUDE
COMBAT RADIUS: 2,400-3,180 km
REMARKS: MAY CARRY AIR-TO-AIR MISSILES.

BLACKJACK A



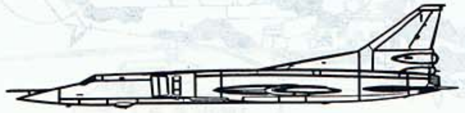
TYPE STRATEGIC BOMBER
MAXIMUM SPEED: APPROXIMATELY MACH 2.3 AT MAXIMUM ALTITUDE
COMBAT RADIUS: 7,500 km (UNREFUELED)
REMARKS SIMILAR TO US B-1 BOMBER BUT LARGER. PRIMARY ROLE WILL BE AS AN INTERCONTINENTAL BOMBER BUT MAY ALSO BE USED FOR NAVAL STRIKE MISSIONS.

Tu-22 BLINDER



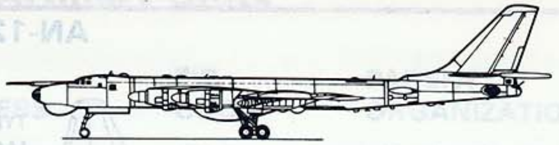
TYPE: STRATEGIC BOMBER[1, 2, 3]
MAXIMUM SPEED: 1,480 km/hr AT ALTITUDE
COMBAT RADIUS: 2,250 km
REMARKS: MAY CARRY A VARIETY OF GROUND ATTACK WEAPONS, INCLUDING AIR-TO-SURFACE MISSILES.

Tu-26 BACKFIRE



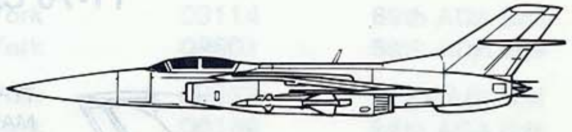
TYPE: STRATEGIC BOMBER[1, 2]
MAXIMUM SPEED: 2,125 km/hr AT ALTITUDE
1,075 km/hr AT SEA LEVEL
COMBAT RADIUS: 4,024-4,750 km
REMARKS: MAY CARRY GROUND ATTACK WEAPONS, INCLUDING AIR-TO-SURFACE MISSILES, AND HAS A VARIABLE WING.

Tu-95 BEAR



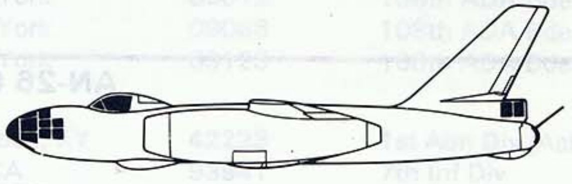
TYPE: STRATEGIC BOMBER[1, 2, 3]
MAXIMUM SPEED: 870 km/hr AT ALTITUDE
COMBAT RADIUS: 6,275 km
REMARKS: MAY CARRY AIR-TO-SURFACE MISSILES.

Yak-28 BREWER



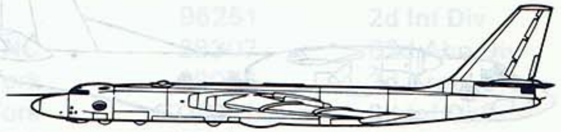
TYPE: LIGHT BOMBER/INTERCEPTOR[1, 2, 3]
MAXIMUM SPEED: 1,175 km/hr AT ALTITUDE
COMBAT RADIUS: 925 km
REMARKS: MAY CARRY A VARIETY OF GROUND ATTACK AND AIR- TO-AIR WEAPONS.

11-28 BEAGLE



TYPE: TACTICAL BOMBER/RECONNAISSANCE
MAXIMUM SPEED: 559 mph (485 KNOTS)
COMBAT RADIUS: 2,260 km
REMARKS: FOUR AUTOMATIC CANNON: TWO 20-mm TWO 23-mm. BOMB LOAD, 4,500 lb.

M-4 BISON



TYPE: STRATEGIC BOMBER
MAXIMUM SPEED: 900 km/hr AT MAXIMUM ALTITUDE
COMBAT RADIUS: 7,000 km
REMARKS: CAN CARRY UP TO 10,000 POUNDS OF BOMBS. HAS TEN 23-mm GUNS IN TWIN-GUN TURRETS FOR SELF PROTECTION.

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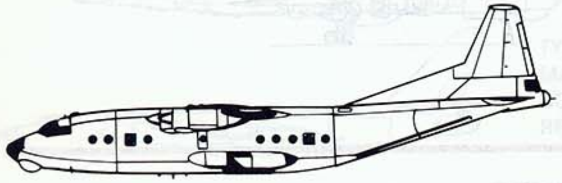
[1] Possible EW configuration.
[2] Possible reconnaissance configuration.
[3] Maximum payload/maximum fuel.

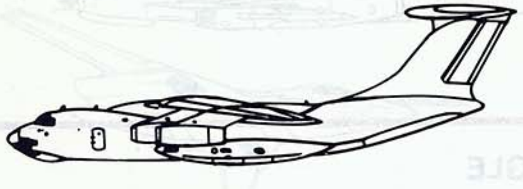
THREAT CARGO/TRANSPORT

AN-12 CUB



TYPE: TACTICAL FREIGHTER; ELECTRONIC INTELLIGENCE
MAXIMUM SPEED: 579 TO 644 km/hr
RANGE: 2,100 mi, 3378.9 km
REMARKS: Two 23-mm; WR-23 CANNON IN TAIL
TROOPS: CAN ACCOMMODATE 100 FULLY EQUIPPED TROOPS. ALSO HAS ECM CAPABILITY.

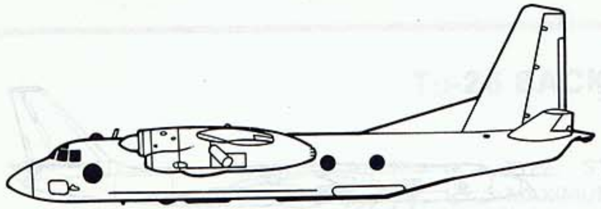
11-76 CANDID



TYPE: STRATEGIC/TACTICAL FREIGHTER
MAXIMUM SPEED: 853 km/hr
RANGE: (4,000 mi) (6,436 km)
REMARKS: WHEN FITTED, TWO 23-mm CANNON IN RADAR-DIRECTED MANNED TURRET.
TROOPS: CAN ACCOMMODATE 140 FULLY EQUIPPED TROOPS.

AN-26 CURL

TYPE: LIGHT TACTICAL TRANSPORT/PHOTOGRAPHIC SURVEY
MAXIMUM SPEED: CRUISING SPEED 270 mph 234.63 knots
RANGE: 1,190.53 km, DEPENDING ON LOAD
REMARKS: UNKNOWN
TROOPS: CAN ACCOMMODATE 40 FULLY EQUIPPED TROOPS.



APPENDIX A

Air Defense Artillery Units

ORGANIZATION	PO ADDRESS	ZIP CODE	PARENT ORGANIZATION
32d AADCOM	APO New York	09175	HQ USAREUR
10th ADA Bde	APO New York	09175	32d AADCOM
1st Bn, 1st ADA (Hawk)	APO New York	09026	10th ADA Bde
2d Bn, 2d ADA (Hawk)	APO New York	09169	10th ADA Bde
69th ADA Bde			
2d Bn, 57th ADA (Hawk)	APO New York	09702	69th ADA Bde
3d Bn, 7th ADA (Hawk)	APO New York	09801	32d AADCOM
3d Bn, 60th ADA (Hawk)	APO New York	09114	69th ADA Bde
6th Bn, 52d ADA (Hawk)	APO New York	09801	69th ADA Bde
94th ADA Bde	APO New York	09227	32d AADCOM
2d Bn, 56th ADA (Herc)	APO New York	09189	94th ADA Bde
2d Bn, 62d ADA (Hawk)	APO New York	09123	94th ADA Bde
3d Bn, 59th ADA (Hawk)	APO New York	09305	94th ADA Bde
3d Bn, 71st ADA (Herc)	APO New York	09154	94th ADA Bde
108th ADA Bde	APO New York	09227	32d AADCOM
2d Bn, 60th ADA (C/V)	APO New York	09012	108th ADA Bde
2d Bn, 67th ADA (C/V)	APO New York	09086	108th ADA Bde
6th Bn, 56th ADA (C/V)	APO New York	09123	108th ADA Bde
DIVISIONAL BNS			
1st Bn, 3d ADA (V/S)	Fort Campbell, KY	42223	1st Abn Div (Aslt)
1st Bn, 51st ADA (C/V)	Fort Ord, CA	93941	7th Inf Div
1st Bn, 55th ADA (C/V)	Fort Polk, LA	71459	5th Inf Div
1st Bn, 59th ADA (C/V)	APO New York	09185	8th Inf Div
1st Bn, 62d ADA (C/V)	Schofield Bks, HI	96857	25th Inf Div
1st Bn, 68th ADA (C/V)	Fort Hood, TX	76545	1st Cav Div
2d Bn, 5th ADA (C/V)	Ford Hood, TX	76546	2d Armd Div
2d Bn, 51st ADA (C/V)	Fort Riley, KS	66442	1st Inf Div
2d Bn, 59th ADA (C/V)	APO New York	09142	1st Armd Div
2d Bn, 61st ADA (C/V)	APO SF CA	96251	2d Inf Div
3d Bn, 4th ADA (V/S)	Fort Bragg, NC	28307	82d Abn Div
3d Bn, 61st ADA (C/V)	APO New York	09076	3d Armd Div
3d Bn, 67th ADA (C/V)	APO New York	09031	3d Inf Div
3d Bn, 68th, ADA (Hawk)	Fort Bragg, NC	28307	XVIII Abn Cps
4th Bn, 61st ADA (C/V)	Fort Carson	80913	4th Inf Div
5th Bn, 52d ADA (C/V)	Fort Stewart, GA	31314	24th Inf Div
5th USA Arty Gp (Whd)	APO New York	09171	59th Ord Bde
559th USA Arty Gp		09221	

ORGANIZATION	PO ADDRESS	ZIP CODE	PARENT ORGANIZATION
9th Inf DIVADA	Fort Lewis, WA	98433	9th Inf DIVADA
1st Bn, 4th ADA (Hawk)	Fort Lewis, WA	98433	9th Inf DIVADA
1st Bn, 67th ADA (C/V)	Fort Lewis, WA	98433	9th Inf DIVADA
11th ADA Bde	Fort Bliss, TX	79916	USAADCENFB
1st Bn, 7th ADA (Hawk)	Fort Bliss, TX	79916	11th ADA Bde
1st Bn, 65th ADA (Hawk)	Fort Bliss, TX	79916	11th ADA Bde
2d Bn, 55th ADA (Hawk)	Fort Bliss, TX	79916	11th ADA Bde
4th Bn, 1st ADA (C/V)	Fort Bliss, TX	79916	11th ADA Bde
The School Brigade	Fort Bliss, TX	79916	USAADASCH
1st Bn, 43d ADA (Patriot)	Fort Bliss, TX	79916	School Brigade
2d Bn, 43d ADA (Patriot)	Fort Bliss, TX	79916	School Brigade
4th Bn, 3d ADA (Patriot)	Fort Bliss, TX	79916	School Brigade
Allied Student Bn	Fort Bliss, TX	79916	School Brigade
Staff & Faculty Bn	Fort Bliss, TX	79916	School Brigade
Student Bn	Fort Bliss, TX	79916	School Brigade
1st ADA Tng Bde	Fort Bliss, TX	79916	USAADASCH
1st Inst Bn (Prov)	Fort Bliss, TX	79916	1st ADA Tng Bde
2d ADA Tng Bn	Fort Bliss, TX	79916	1st ADA Tng Bde
3d ADA Tng Bn (Osut)	Fort Bliss, TX	79916	1st ADA Tng Bde
4th ADA Tng Bn (Osut)	Fort Bliss, TX	79916	1st ADA Tng Bde

APPENDIX B

ADA Commissioned Officers and Related SSIs

COMMISSIONED OFFICERS

14A	Air Defense Artillery Officer—General
*14B	SHORAD Officer
14C	Nike Hercules Missile ADA Officer
14D	Hawk Missile ADA Officer
14E	Patriot ADA
14G	ADA Command and Control Officer

*Not available to women soldiers.

APPENDIX C

ADA Warrant Officers and Related MOSs

WARRANT OFFICERS

22	**Air Defense Electronic Maintenance**
221B	**Nike Assembly Technician**
222B	**Nike Fire Control Technician**
222C	**Patriot System Technician**
223B	**Hawk System Technician**
*224B	**SHORAD System Technician**

*Not available to women soldiers.

APPENDIX D

ADA Enlisted and Related MOSs

MOS/TITLE		CMF	SKILL LEVEL
16B	Hercules Missile Crew Member	16	1 - 4
16C	Hercules FC Crew Member	16	1 - 3
16D	Hawk Missile Crew Member	16	1 - 4
16E	Hawk FC Crew Member	16	1 - 3
*16F+	Light ADA Crew Member	16	1 - 4
*16G	Roland Crew Member**	16	1 - 3
16H	ADA Operations-Intelligence Assistant	16	1 - 4
16J	Defense Acquisiton Radar Operator	16	1 - 3
*16L	SGT York Crew Member	16	1 - 4
*16P	ADA Short Range Missile Crew Member	16	1 - 3
*16R	ADA Short Range Gunnery Crew Member	16	1 - 4
*16S	MANPAD Crew Member	16	1 - 4
16T	Patriot Missile Crew Member	16	1 - 5
16Z	ADA Senior Sergeant	16	5
22L	Nike Test Equipment Repairman	23	1 - 3
22N	Nike Hercules Missile-Launcher Repairman	23	1 - 3
23N	Nike Track Radar Repairman	23	1 - 3
23U	Nike HP Radar Simulator Repairman	23	1 - 3
23W	Nike Maintenance Chief	23	4 & 5
24C	Hawk Firing Section Mechanic	23	1 - 4
24E	Hawk Firing Control Mechanic	23	1 - 3
24G	Hawk Coordination Central Mechanic	23	1 - 3
24H	Hawk Fire Control Repairman	23	1 - 3
24J	Hawk Pulse Radar Repairman	23	1 - 3
24K	Hawk CW Radar Repairman	23	1 - 3

*Not available to women soldiers
**Reserve Component

MOS/TITLE		CMF	SKILL LEVEL
24L	Hawk Launch/Mechanic System Repairman	23	1 - 3
*24M	Vulcan System Mechanic	27	1 - 4
*24N	Chaparral System Mechanic	27	1 - 4
24P	Defense Acquisition Radar Mechanic	23	1 - 4
24Q	Nike Hercules FC Mechanic	23	1 - 4
24R	Hawk Master Mechanic	23	4 & 5
*24S	Roland Mechanic**	27	1 - 5
24T	Patriot System Mechanic	23	1 - 4
24U	Hercules Electronics Mechanic	23	1 - 4
24V	Hawk Maintenance Chief	23	4 & 5
*24W	SGT York System Mechanic	23	1 - 4
25J	Operations Central Repairman	23	1 - 4
25L	AN/TSQ-73 Operator/Repairman	23	1 - 4
26H	Air Defense Radar Repairman	23	1 - 3
*27C	Roland Repairman**	27	1 - 4
*27D	Roland FMTS Repairman**	27	1 - 4
27F	Vulcan Repairman	27	1 - 3
27G	Chaparral/Redeye Repairman	27	1 - 4
27N	FAAR Repairman	27	1 - 3
27P	SGT York System Repairman	27	1 - 4
27Q	SGT York System Test Specialist	27	1 - 4

*Not available to women soldiers
**Reserve Component

References

Department of the Army pamphlets of the 310-series should be consulted frequently for the latest changes or revisions of references given in this appendix and for new publications relating to material covered in this manual. Complete titles for the references listed below can be found in DA Pam 310-series.

ARMY REGULATIONS (AR)

310-10	Military Orders
611-101	Commissioned Officer Specialty Classification System.

FIELD MANUALS (FM)

9-59	Unit Operations for Support of Missile and Air Defense Gun Systems.
21-26	Map Reading.
21-30	Military Symbols.
24-1 (HTF)	Combat Communications.
44-1	Air Defense Artillery Employment.
44-1A (S)	US Army Air Defense Artillery Materiel (U).
44-1-1	Air Defense Artillery Operations
44-2	Air Defense Artillery Employment Automatic Weapons M42/M55.
44-3	Air Defense Artillery Employment: Chaparral/Vulcan (How to Fight).
44-4	Operations and Training, Chaparral.
44-5	Operations and Training, Vulcan.
44-6	Operations and Training, Forward Area Alerting Radar (FAAR) and Target Alert Data Display Set (TADDS).
44-8	Small Unit Self-Defense Against Air Attack.
44-15	ADA Employment, Patriot.
44-16B/TG	Trainer's Guide: 16B, Hercules Missile Crewmember
44-16B1/2	Soldier's Manual: 16B, Hercules Missile Crewman (Skill Level 1/2).

44-16B3/4	Soldier's Manual: 16B, Hercules Missile Crewmember (Skill Level 3/4).
44-18	Air Defense Artillery Employment, Stinger.
44-18-1	Stinger Team Operations.
44-23	US Army Air Defense Employment, Redeye.
44-23-1	Operations and Training, Redeye.
44-61	Procedures and Drills for Twin 40-MM, Self-Propelled Gun, M42 and M42A1.
44-62	Air Defense Artillery Automatic Weapon Gunnery.
44-70 (C)	Air Defense Artillery Command and Control System AN/TSQ-73 Missile Minder (U).
44-90	Air Defense Artillery Employment, Hawk.
44-90-1	Hawk Firing Platoon Operations.
44-95	Air Defense Artillery Employment, Hercules.

TECHNICAL BULLETIN (TB)

11-5810-243-14-2	General Maintenance Information for Communications Security Equipment TSEC/ST-GA.

TRAINING CIRCULAR (TC)

44-5-1	Vulcan (SP) Combat Operations.

TECHNICAL MANUALS (TM)

9-1005-286-10	Operator's Manual (Crew) for Gun, ADA, Towed, 20-MM.
9-1005-286-20/2	Organizational Maintenance Manual for Gun, Air Defense Artillery, Towed.
9-1005-286-20-1	Organizational Maintenance Manual for Gun, ADA, Towed, M167A1.
9-1005-286-20-2	Organizational Maintenance Manual for Gun, ADA, Towed, M167A1.

9-1400-425-12	Operator and Organizational Maintenance Manual, Redeye, Guided Missile System.
9-1425-429-12	Operator's and Organizational Maintenance Manual, Stinger Guided Missile System.
9-1425-525-1 (C)	Hawk Air Defense Guided Missile System (U).
9-1425-600-12	Operator's and Organizational Maintenance Manual, Patriot.
9-1425-625-10	Operator's Manual, Roland Low-Altitude AD System.
9-1425-650-12	Operator's and Organizational Maintenance Manual for Overall System Description (Guided Missile Air Defense System, AN/TSQ-73).
9-1425-1585-10-1	System Description of Improved Chaparral Air Defense Guided Missile System.
9-1430-580-14	Operator, Organizational, Direct Support, and General Support Maintenance Manual. Coordinated Air Defense System AN/GSA-77.
9-1430-651-12	Operator's and Organizational Maintenance Manual for Emplacement, Guided Missile Air Defense System AN/TSQ-73.
9-1430-655-20-1	Organizational Maintenance Manual for Overall System Maintenance for the AN/TSQ-73.
9-2300-257-20	Organizational Maintenance Manual: Carrier, Personnel, Full-Tracked Armored.
9-2350-300-10	Operation and Maintenance Manual (Crew) for Gun, Air Defense Artillery, Self-Propelled: 20-MM, M163A1.
9-2350-300-20-1	Organizational Maintenance Manual: ADA Self-Propelled, 20-MM M163A1
9-2350-300-20-2	Organizational Maintenance Manual for Gun, Self-Propelled, 20-MM M163A1.
9-6920-429-12	Operator's and Organizational Manual for Training Set, Stinger Guided Missile System.
9-7218	Operator's and Organizational Maintenance Manual: Gun, Antiaircraft Artillery, Self-Propelled: Twin, 40-MM, M42.
11-5805-201-12	Operator and Organizational Maintenance Manual, Telephone Set TA-312/PT.

11-5805-243-12	Operation and Organizational Maintenance Manual: Telephone Set, TA-1/PT.
11-5805-262-12	Operator's and Organizational Maintenance Manual: Switchboard, Telephone Manual, SB-22/PT.
11-5805-294-15	Operation and Organizational and Field Maintenance: Switchboard, Telephone Manual SB-993/GT.
11-5815-331-14	Operator's Organizational, Direct Support, and General Support Maintenance Manual: Radio Teletypewriter Set AN/VSC-2.
11-5815-334-12	Operator's and Organizational Maintenance Manual for Radio Teletypewriter Sets, AN/GRC-142, AN/GRC-142A.
11-5820-401-12	Operator's Organizational and Maintenance for Radio Sets.
11-5820-401-34-3	Direct Support and General Support Maintenance Manual, Radio Set AN/VRC-12.
11-5820-477-12	Operator's and Organizational Maintenance Manual. Radio Set Control Groups AN/GRA-39, AN/GRA-39A, and AN/GRA-39B.
11-5820-520-12	Operator's and Organizational Maintenance Manual: Radio Sets, AN/GRC-106.
11-5820-540-12	Operator's and Organizational Maintenance Manual: Radio Set, AN/GRC-103.
11-5820-562-14	Operator's Organizational, Direct Support, and General Support Maintenance Manual: Repeater Sets, Radio, AN/TRC-113.
11-5820-667-12	Operator's and Organizaitonal Maintenance Manual Radio Set.
11-5895-453-14	Operator's and Organizational Direct Support and General Support Radio Terminal Set AN/TRC-145.
11-5995-205-15	Operator, Organizational, Direct Support, General Support, and Depot Maintenance Manual: Cable Assembly.

Note: Refer to DA Pamphlet 310-series for complete and current titles.

JOINT CHIEFS OF STAFF PUBLICATIONS (JCS Pub)

JCS Pub-1	Dictionary of Military and Associated Terms.
JCS Pub-8	Doctrine for Air Defense From Oversea Land Areas.
JCS Pub-9	Doctrine for the Defense of the United States Against Air Attack.

ALLIED TACTICAL PUBLICATIONS (ATP)

33	NATO Tactical Air Doctrine.
42	Counter Air Operations.

PROJECTED RELATED PUBLICATIONS

These related publications are scheduled for printing. Upon DA print, they will be distributed automatically via pinpoint distribution and will not be available from USA AG Publications Center, Baltimore, until indexed in DA Pam 310-1.

FM 44-10(HTF)	Air Defense Artillery Employment, Roland.
FM 44-11(HTF)	ADA Employment, SGT York.
FM 44-11-1	Operations and Training, SGT York.
FM 44-15 (HTF)	Operations and Training, Patriot.
FM 44-15-1	Patriot Battalion Operations
FM 44-72	Command and Control of SHORAD Weapons.

Glossary

ABREVIATIONS AND ACRONYMS

AA	antiaircraft
AADC	area air defense commander
AADCOM	Army air defense command
ABMTS	air battle management training system
AC	aircraft
ACA	airspace control authority
ACC	airspace control center
ACofS	Assistant Chief of Staff
ACR	armored cavalry regiment
AD	air defense
ADA	air defense artillery
ADC	air defense control
ADEWS	air defense electronic warfare system
ADIZ	air defense identification zone
ADL	automatic data link
ADOA	air defense operations area
ADOC	air defense operations center
ADP	automatic data processor
ADOLT	air defense operations liaison team
ADTSS	air defense tactical system simulator
ADW	air defense warning
AGES	air-to-ground engagement simulator
AH	attack helicopter
AIM	armored-infantry-mechanized
AME	airspace management element
AMG	antenna mast group
AMLS	airspace management liaison section
ARM	antiradiation missile
ARO	auxiliary read-out
ASM	air-to-surface missile
ASP	ammunition supply point
ATC	air traffic control
ATDL	Army tactical data link
BCC	battery control central

BIT	built in test
BITE	built in test equipment
BOC	battalion operations center
BTMS	battalion training management system
C&A	command and administration
C^2	command and control
C^3	command, control, and communications
CAS	close air support
CDS	container delivery system
C-E	communications-electronics
CEOI	Communications-Electronic Operating Instructions
CLS	contractor logistic support
cm	centimeter
COMMZ	communications zone
CONUS	Continental United States
CP	command post
CPX	command post exercise
CRC	control and reporting center

CRP	control and reporting post
CRT	cathode ray tube
C/V	Chaparral/Vulcan
CWAR	continuous wave acquisition radar
DAME	division airspace management element
DARCOM	US Army Materiel Development and Readiness Command
DDG	data display group
DEFCON	defense readiness condition
DEFREP	defense readiness posture
DISCOMM	division support command
DS	direct support
DSA	division support area
DSB	division support battery
DSP	direct support platoon
DSS	direct support system
ECCM	electronic counter-countermeasures
ECM	electronic countermeasures

ECS	engagement control station
EW	electronic warfare
EWBN	early warning broadcast net
FAAR	forward area alerting radar
FCC	flight control center
FCO	fire coordination officer
FDC	fire direction center
FEBA	forward edge of the battle area
FLOT	forward line of own troops
FLIR	forward looking infrared
FM	frequency modular
FMTS	field maintenance test station
FOUO	for official use only
FTX	field training exercise
GAL	gallon
GOC	group operation center
GS	general support
GS-R	general support-reinforcing

HE	high explosive
HF	high frequency
HIDACZ	high density airspace control zone
HIMAD	high-to-medium-altitude air defense
HIMEZ	high-altitude missile engagement zone
HIPAR	high power acquisition radar
HIPIR	high powered illuminator radar
HTLD	high tech, light division
IAW	in accordance with
ICBM	intercontinental ballistic missile
IFF	identification, friend or foe
IR	infrared radiation
IRBM	intermediate range ballistic missile
IRCM	infrared counter measures
IRR	intelligence radar reporting
kg	kilogram
LABS	low-altitude bomb aiming system

LADS	lightweight air defense system
lb(lbs)	pound
LOMEZ	low-altitude missile engagement zone
LOPAR	low power acquisition radar
LOS	line of sight
LS	launching station
MANPAD	man-portable air defense
mi	miles
MILES	multiple integrated laser engagement simulator
mph	miles per hour
MRR	minimum risk route
MSCS	manual SHORAD control system
MTR	missile tracking radar
NATO	North Atlantic Treaty Organization
NBC	nuclear, biological, chemical
NORAD	North American Air-defense Command
OCONUS	outside continental United States

OPLAN	operation plan
OPORD	operation order
o/o	on order
PAR	pulse acquisition radar
POL	petroleum, oils, and lubricants
PPI	planned position indicator
PTL	primary target line
RADAS 2000	regimented air defense artillery system
RADC	region air defense commander
RADES	realistic air defense engagement system
RCAT	radio controlled aerial target
ROE	rules of engagement
ROR	range only radar
RPV	remotely piloted vehicle
RS	radar set
RSOP	reconnaissance, selection and occupation of position
SAM	surface-to-air missile

SEAD	suppression of enemy air defense
SHORAD	short-range air defense
SOC	sector operations center
TAADCOM	Theater Army Air Defense Command
TACC	tactical air control center
TADDS	target alert data display set
TASKO	task organization
TBM	tactical ballistic missile
TF	task force

TOE	table of organization and equipment
TRR	target ranging radar
TS	tracking station
TTR	target tracking radar
USAADASCH	US Army Air Defense Artillery School
VADS	vulcan air defense system
WCC	weapons control computer
WEZ	weapon engagement zone

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